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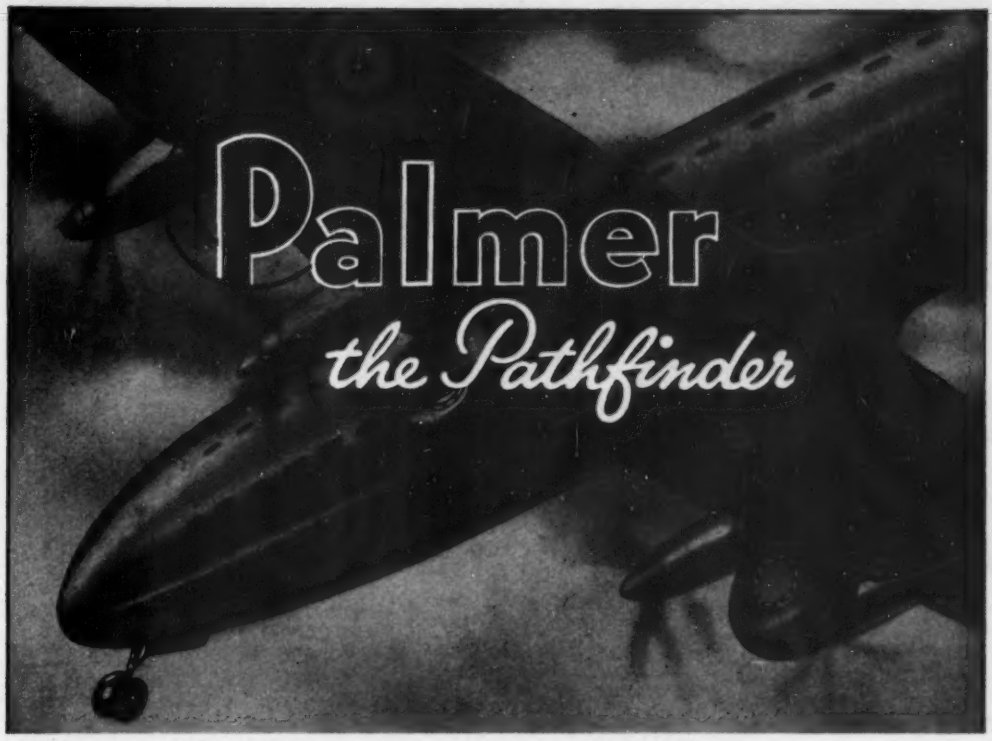

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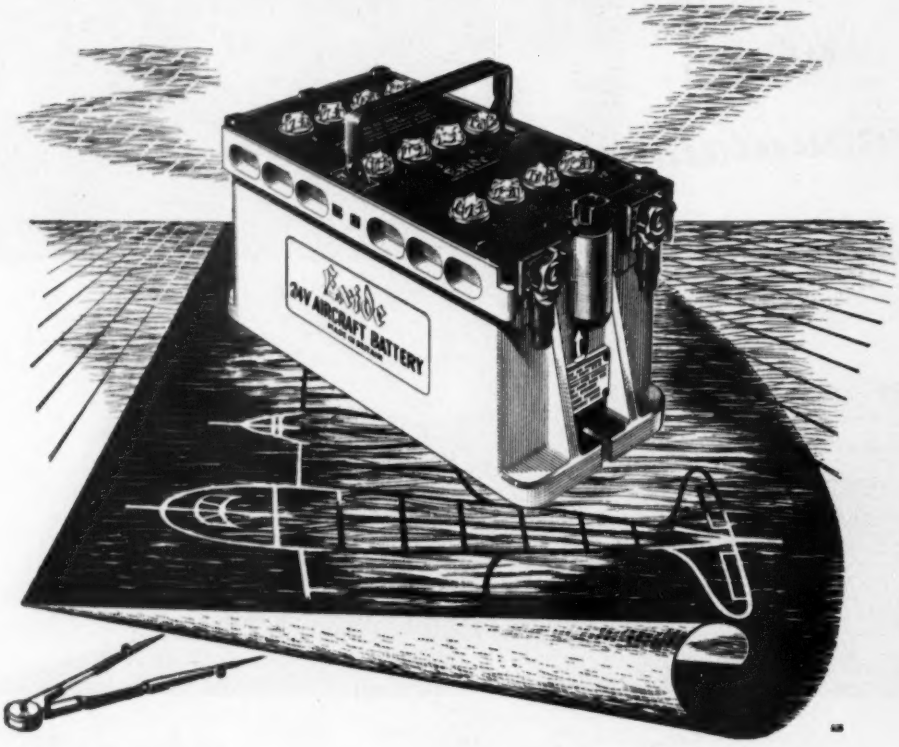

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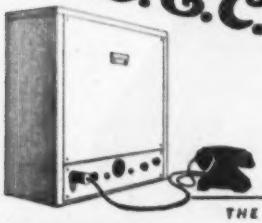

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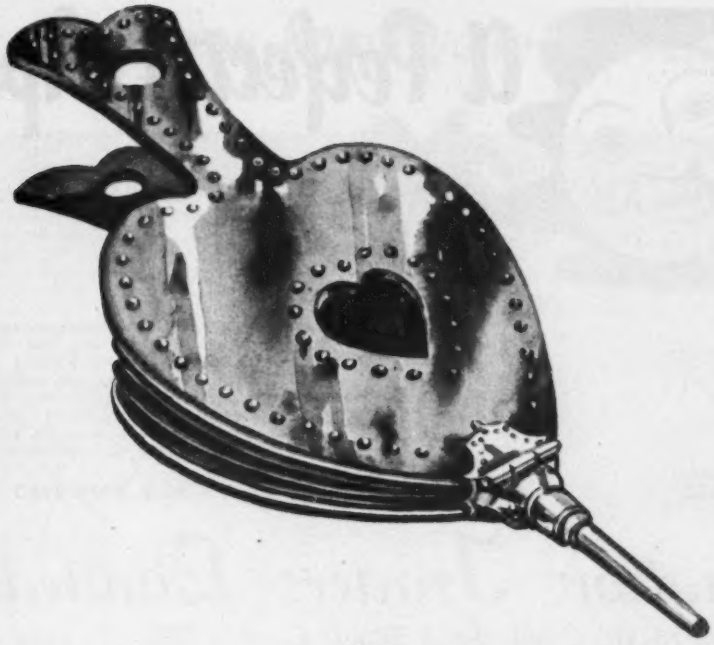

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Who Lets Slip Fortune . . .

ONCE again, this week, we print several references to manpower and material shortages, to aircraft-production time and cost, and to kindred matters. Current difficulties continue to raise costs, and to delay re-equipment; this means, ultimately, less efficient aircraft in service (because designs have to be frozen years before the aircraft reach service with squadrons or airlines) and, by the same token, less freedom in developing good basic designs to keep abreast of requirements.

The intensity of effort devoted to military production is to a great extent related to estimation of the degree of national emergency by both the Government and industrial leaders. Directives can be issued and orders placed, but the Government cannot in the normal course of events compel firms to expand their capacity and their sub-contract arrangements to produce any more rapidly than they wish. Conversely, the most progressive of companies cannot get very far today without official aid in the matter of scarce materials, imported machine tools, extensions to buildings, and so on.

It is *Flight's* impression that the sense of urgency is limited to but a few people, and that nothing short of a war which directly threatens this country is going to produce a national effort worthy of the adjective "all-out." Too many people are still content to talk and plan in a theoretical sort of way, thinking wishfully that nothing really serious will boil up. Several companies in the aircraft industry are undoubtedly anxious to make a genuine all-out effort, and whether or not it is concentrated primarily upon military or commercial aircraft production, or equally upon both, is not, perhaps, the point of greatest importance.

Air Chief Marshal the Hon. Sir Ralph Cochrane's words to the Air League at Bristol impressed many: ". . . Air power, if it is to be permanent, must be broad-based on commerce. . . . I saw ships being built for owners all over the world as well as for our own trade, and I was thinking again what a great influence this had had on our life as a seafaring nation. It is on that foundation that we have built up our sea power. The air must do the same, and I see no reason why it should not. Let them (the youth of the country) realize that we are only at the beginning of the air age, that we have hardly scratched the surface of what will come to be done in our lifetime . . ."

What we want to be sure about in the first place is that there is a determination to fulfil a realistic programme of aircraft production. Are all the firms working to capacity? Are there any real objections to allowing firms outside the industry to come in and make a worth-while contribution? Are there plans to take over the shadow factories once more? Is it too much to hope that the news, just announced, that Shorts are to build Comets at Belfast (and without interruption of their Canberra programme) is a portent of a wider resurgence throughout the industry?

The Airliner Opportunity

Overleaf we publish Charles Gardner's critical views on Britain's opportunities in the jet-airlines market. If we accept his judgments—and most people will agree with at least the fundamentals—then do we also believe that something must and can be done? Can we each ask ourselves straightforwardly, "Do you think that something will in fact be done?"—and honestly feel the answer to be "yes"? This is a good measure of each man's faith and determination. *Flight* feels—as strongly today as when the subject was first discussed—that fortune has presented this country with a not-to-be-repeated opportunity in the civil aircraft field. Rarely is more than one new form of propulsion perfected in a generation, and seldom is one country allowed to take such a lead as Britain had (and still has) in jet propulsion.

Though formidable to meet, the actual physical requirements of such a great and vital task as that facing the aircraft industry are, we believe, within Britain's capacity, in spite of her many other commitments. Successful accomplishment of the task is likely to have a profound effect upon the whole nation's fortunes and future. He who doubts should endeavour to imagine what the last 150 years of our history would have been without the Royal and the Merchant Navies.

TOO SMALL, TOO FEW

Britain's Jet-airliner Market: Danger of Missing the "Air Coach"

By CHARLES GARDNER

IN this forthright article Charles Gardner reviews the pleas that have lately been made in these columns for a speed-up of our jet-transport programme, military orders notwithstanding; it is action that must be taken at once, for soon it will be too late to capitalize our present lead in civil jet development. And now, as W.C. Gardner goes on to explain, there is a complicating factor—the remarkable swing-over during recent months, both by public and operators, to the idea of "air-coach" or high-density-seating travel. It already seems clear that, except in the case of the Bristol Britannia, the passenger-capacity of current British jet airliners falls below what is likely to be demanded in the very near future. Our contributor urges that any existing plans for expanding the capacity of Comets and Viscounts should forthwith receive priority and publicity. Finally, he stresses once again the importance of firm delivery dates in attracting the foreign operator.

A FEW weeks ago I wrote an article in *Flight* saying that the age of opportunity had dawned for British Civil Aviation. Indeed, I went farther than that, and said that not only for the industry, but for England, these next must be the golden years which, assuredly, would never come again.

In all great crises, individual or international, one finds that Shakespeare has, somewhere, set down precisely the form of words for which our minds are groping. Brutus covers this particular situation with:

> "There is a tide in the affairs of men
> which, taken at the flood,
> Leads on to fortune."

For British civil aviation that tide is truly at the flood, and, in our lifetime, and that of our children, it is unlikely to rise so high again. "Now or never" almost equally hits the mark.

Since that article appeared a number of people have sent me letters. Most have agreed with what was said, but in several I detected a jarring note of complacency. They neatly reversed the armament-and-airliner production problem, and maintained that we still had time to "beat the Spaniards" and then play our "game of bowls."

That is not so. It is not (repeat not) true.

The time-bracket within which we must produce the turbine airliners is between 1954 and 1958. It does not straggle into the 1960s. Furthermore, the versions from 1958 onwards must be substantially better, in capacity and performance, than the existing, or immediately projected, Comets, Britannias and Viscounts.

What this means, as a matter of practical engineering, is that the complex problems of manpower, materials and factory space as related to the rearmament programme on one hand, and the great airliner opportunity on the other, must be resolved by the end of this year. By Farnborough time, our aircraft manufacturers must be able to offer to the world four things:

(1) Firm delivery dates, in quantity, from 1954 onwards.
(2) A development programme for each airliner comparable with that which Lockheeds have followed from the original Constellation (designed 1939, first flew 1943).
(3) A re-engining programme to match the increasing weights and sizes of these later marks.
(4) A replacement programme, with prototypes flying in about 1957-8.

In my view, nothing less than this will even keep our foot in the door, because the great manufacturers of the United States are now after us, and in full cry.

We must take notice that the DC-6B, now operating, and the Super-Constellation, to follow shortly, are formidable aeroplanes which are attracting cash-down orders. There is, too, a plan for a turboprop version of the Connie using P. and W. T-34 engines (the fact that this is a naval order does not affect the main argument), and Lockheeds have completed a design for a pure-jet liner. So have Douglas and Boeing, while the DC-7, with Wright Turbo-Cyclone R.3350s of 3,250 h.p., will be a very, very competitive airliner.

As further evidence of the earnestness of the American industry in this matter there comes news this week that the C.A.A. prototype committee has sponsored a new plan [reported on page 258.—ED.] for testing three jet aircraft types on commercial airways. These are the Avro Jetliner, the Douglas F-3D night fighter and the B-45. We may laugh a little at this odd mixture of an experimental and obsolescent commercial jet, a fighter and a bomber, but much information will doubtless stem from them. Finally we can no longer delude ourselves that the American manufacturers are going to hang on in the hope of Senator McCarron's subsidy bill going through.

Peter Masefield, just returned from a tour of the United States, is already sounding a warning against over-satisfaction with our present gas-turbine types as such. He reminds us that the overriding factor in the minds of all operators, including B.E.A. is cost per seat-mile. In this, it is the big aeroplane which rings the cash register. The present Comet and Viscount are too small and, though the Britannia is ideal, the danger is that it may be too late.

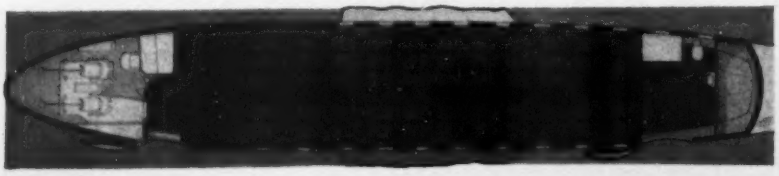
In an article in the *Shell Magazine* [summarized on page 278 of this issue.—ED.] Masefield says that by the 1960s the inevitable demand will be for aircraft offering from 70 to 120 seats. This will induce cheaper fares, leading to more traffic, and ending in a benevolent spiral which will sweep air transport to a major place in world affairs.

Unfortunately for us, there is now a tendency to regard the Super-Constellation, the DC-6B and the DC-7 as being much nearer the right answer to the air-coach age than the Comet I, the Comet II and the Viscount. The Britannia, alone, it is said, offers a perfect solution to that key division-sum of seats into cost; but there are cynical doubts as to Britain's ability to produce the Britannias in sufficient numbers or to schedule.

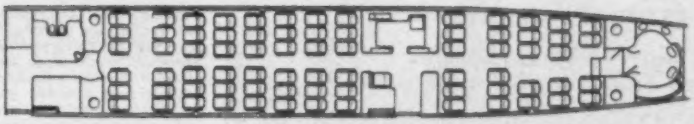
We have to face the fact that, whatever the rights and wrongs of the case, the above is the view of many foreign operators, and the only possible answer is to produce the aeroplanes of the size they want by the time they are wanted, which is by 1957 at the latest.

It can be done.

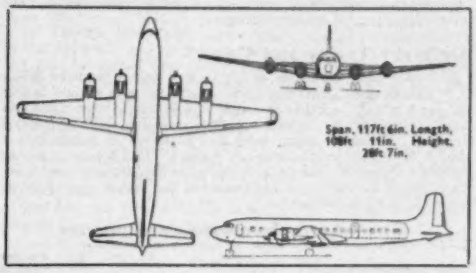
The Viscount started out as a 32-seater. It is now up to 40 seats or, as a "coacher," 53 seats. I suggest that by 1954 there should be a stretched and developed Viscount with 60 seats—and for guaranteed deliveries in 1956-57. The 40-53-seater has a chance on world markets if produced by the required date (there are some healthy enquiries for them), but it is a 60-seater Viscount which would really sell. It would, however, presumably need bigger engines than the present Darts. But is there any possibility of a Dart replacement?



A 48-seat standard-length Viscount looks far from "coach-crowded." A 40-seat version goes into service this year.



(Right) The Bristol 175 starts where others are leaving off, and a first-class layout is shown to accommodate 74 passengers. High-density arrangements allow over 100 seats to be fitted, and as yet there has been no elongation of the fuselage.



(Left) An American development towards which many eyes have recently turned is the 95-seat DC-7. High powered (13,000 h.p. total) and with long fuselage, it will offer fast and economical travel. It is expected to fly in a year's time, and deliveries are quoted for the summer of 1953. Provision of emergency exits for so many "pressurized" passengers may embarrass the designer of this and other stretched types.

Similarly with the Comet. The present version has nearly every advantage in the world, save that of capacity. What is wanted, again flying in prototype by 1954 and in service by 1956—is a 60-seater Comet (instead of a maximum of 48); who could then afford to be without it?

This *could* be done and, if we are really to corner this opportunity, it will *have* to be done. And if de Havillands have plans (as I understand they have), for a lengthened-fuselage Series II Comet, would not now be a good time to impress this fact upon the customers? All this development, of course, must be an ever-continuing process so that, before 1960, prototypes of genuine replacements for both these aeroplanes should be seen at Farnborough. (Incidentally, how about a civil Valiant to keep the ball of competition bouncing?)

That, then, is how the picture appears, as judged by the eyes and the cash-registers of big air-transport operators abroad. They want, above all, bigger capacity and firm delivery dates; at the same time they harbour an almost open disbelief that British factories, burdened by re-armament, can menace the world markets of Lockheeds and Douglas.

As things are, one is half-tempted to agree with them. De Havilland letters quoted in America's *Aviation Week* last November, gave late 1955 or 1956 as the earliest delivery dates of Series I or Ia Comets. The reported Filton production-rate for the Britannia is that it will be no less than 1½ a month! The end of the present Viscount queue is, I gather, in 1955. Are we, in fact, in danger of producing the wrong aeroplanes too early, and the right ones too late, and both in numbers that are too small?

Whatever we think, there can be little doubt on my final point, which is that, if we *do* lose the 1957-59 battle, Britain can forget its world civil aircraft aspirations probably for generations. The time to take our tide is now, and—to change the analogy—there will not be another one along in a minute; or in a year; or in a decade.

In 1949 we published this proposed 48-seat layout for the standard Comet. A 10ft fuselage-extension would permit 60 seats to be fitted with only four abreast.

FROM ALL QUARTERS

Britain's Air Contribution to NATO

AS we reported last week, the NATO Conference in Lisbon agreed on a target figure of 4,000 first-line aircraft for the defence of Western Europe, this total to be achieved by the end of the year.

A subsequent announcement named 1,300 aircraft as the British contribution to the total.

It is expected that the 1,300 will be composed of some 400 American and/or Canadian-built Sabres; of the first-line strength of 2nd T.A.F., which by the end of the year should be considerably reinforced by Venoms, as an addition to the Meteors, Vampires and (a few) Mosquitoes at present equipping the force; and, finally, of a tactical bomber force composed of as many Canberra squadrons as will be fully operational within the stated time.

New Parliamentary Under-Secretary

IT was announced on February 28th that Mr. Nigel Birch, Parliamentary Under-Secretary of State for Air since soon after the present Government took office, has been appointed Parliamentary Secretary to the Minister of Defence. His duties in his new post are likely to be arduous, for Viscount Alexander, the new Defence Minister, sits in the Lords; Mr. Birch, therefore, will find himself carrying a Ministerial burden in the Commons.

His successor as Parliamentary Under-Secretary for Air is G/C. the Hon. George R. Ward, M.P., a brother of the Earl of Dudley. Born in 1907, he was educated at Eton and Christ Church, Oxford, and joined No. 601 (City of London) Squadron, R. Aux. A.F., in 1929. He became a Regular in 1932, and served until 1937. On the Reserve list in the meantime, he was recalled at the outbreak of war, and served until 1945, attaining the rank of group captain. He was then elected Conservative M.P. for Wolverhampton, and has been returned for the same constituency at both elections since.

G/C. Ward has been chairman of the Conservative Parliamentary Air Committee and vice-chairman of the party's Defence Committee.

G/C. G. R. Ward.

Mr. Nigel Birch.

FROM ALL QUARTERS . . .

Shorts to Build Comets

A JOINT announcement by Short Brothers and Harland, Ltd., and the de Havilland Aircraft Co., Ltd., states that, with a view to doubling the output of Comet jet airliners, they have come to an agreement for the manufacture of Comets (Series II, we understand) at the Short Bros. and Harland works at Belfast. It is the intention "to utilize the resources of the two companies to achieve maximum efficiency," and the first aircraft from the new production line should emerge in 1954. The marketing of the Comet will continue to be handled by the de Havilland Aircraft Co., Ltd.

Short Brothers and Harland also announce changes in the staff of certain departments. The two chief appointments are those of Mr. P. S. Lewis, A.F.R.Ae.S., to the post of superintendent of research and development and of Mr. R. Beaney, A.F.R.Ae.S., to that of experimental shop manager. Both these departments have only recently been formed; as is commonly the case, the former deals chiefly with more fundamental research, while the experimental shop will be responsible for prototype production.

Mr. Lewis has Mr. J. C. Bissett, Wh.Sc., A.C.G.I., A.M.I.Mech.E., A.F.R.Ae.S., as his deputy. Other recent appointments include : Mr. W. Brunskill as an assistant designer; Mr. E. Lloyd Thomas, B.Sc.(Hons.), A.C.G.I., as instrumentation engineer to the company's precision engineering division; and Mr. S. Johnston as works engineer.

Rising Wind

FLOWN by M. Marchandeau, production test pilot of the French S.N.C.A.S.E. works, a Mistral (Nene-Vampire) fighter —of the type illustrated on page 177 of *Flight* for February 15th last—has climbed to 40,000ft in 9 min 45⅘ sec.

It may be recalled that the special long-span Ghost-powered Vampire which attained a height of 59,446ft in March, 1948, passed the 40,000ft level 7⅘ min after take-off.

Damaged Canberras: Employee Sentenced

AT Liverpool Assizes last Friday, Derek Butler, a 22-year-old fireman at an aircraft factory, was sentenced to six months' imprisonment. On January 24th, at Lancaster Assizes, he had pleaded guilty to causing malicious damage to Canberra bombers at the Warton airfield of the English Electric Co. Evidence had then been given of a control-tube being found partly sawn through, and of other damage.

Passing sentence, Mr. Justice Finnemore told Butler that his act might have resulted in a terrible disaster and loss of life. "I am satisfied from what the police say that there was nothing in this other than mischief and wrong conduct," added the Judge. "There is no suggestion that you were, with anybody else, trying to sabotage aeroplanes."

Decca for B.E.A.

FOR years now, *Flight* has consistently advocated the use of the Decca navigator system for aircraft; it is thus with satisfaction that we can now report that British European Airways have decided, subject to a satisfactory contract agreement, to adopt the system for operation of the Corporation's fleet. By this decision, B.E.A. have taken a step which will not only increase the operational effectiveness of its aircraft, but which will also bring economies and promote safety. That Decca is the most satisfactory aid for helicopters was stated by Mr. Peter Masefield in January. It is to be hoped that other airlines will follow the lead now given.

A common argument levelled against Decca is that it is limited to Europe and is thus inapplicable to aircraft operating extra-European routes. The Decca Navigator Company's answer to this is their new Integrated Track-Range (I.T.R.) system. How long it may be before I.T.R. becomes accepted would, however, seem to depend on potential user-demand.

For readers who wish to refresh their knowledge of Decca, the more recent main articles dealing with the system were published in *Flight* on June 2nd, 1949, and January 11th, 1951.

What, no Sabres?

SPECIAL flights will probably be made over America's airways by an Avro Canada Jetliner, a Douglas F3D Skyknight night-fighter and two North American B-45 Tornado bombers as part of a $1.4 million C.A.A. jet-aircraft test programme requested by President Truman. The President said that a number of aircraft will be extensively operated in order to collect needed information on jet operation and the associated problems of air safety and air-traffic control. The tests, scheduled to last until June 30th, 1953, will include 365 hours of operational tests with the Jetliner, 325 hours with the Skyknight and 100 hours with the Tornadoes.

The Air Transport Association has told the C.A.A. Prototype Committee that the airlines are in favour of the proposed prototype testing plan, and has listed 28 specific questions they need to have answered before they can complete specifications for a new jet transport design. Once these are answered, the airlines plan to deal directly with manufacturers to have one or more jet transports built. The A.T.A. does not want any special subsidy to help in building a prototype jet transport.

Last year Congress refused a C.A.A. budget request for prototype funds to test a B-45 in simulated airline operations, but the new programme is wider in scope.

Delivery Times and Costs

AIR and Navy Estimates, and a Second Report from the Select Committee on Estimates, have been dealt with at some length on pages 263-264. Below are some figures for delivery times and costs of equipment, which are both revealing and of general interest. These are taken from lists included in Appendices 7 and 8 of the Select Committee's Report. The present time-lag between receipt of indents from customer Departments and commencement of delivery of equipment to the Forces may be taken approximately as follows :—

INTERVAL BETWEEN ORDERING AND DELIVERY

	Months
Heavy and medium guns	18 to 24
Ammunition	10 to 12
Armoured vehicles	24
Unarmoured vehicles	15 to 18
Aircraft:	
Existing types	18 to 26
New types	23 to 29
Radio and radar:	
Follow-on contracts	10 to 12
Current designs not in current production	15 to 18
New designs	24

REPRESENTATIVE PRICES OF MILITARY EQUIPMENT

Store	1945 Price	Feb. 1951 Price	Latest Price
	£ s. d.	£ s. d.	£ s. d.
Clothing and textiles:			
R.A.F. jackets (serge) (other airmen)	1 6 10	2 6 4	2 9 0
Ammunition:			
20 mm ball cartridges (linked and packed), per 1,000	114 11 0	190 0 0	200 0 0
60 lb H.E. aircraft rocket projectile	4 12 0	9 10 0	13 0 0
Weapons:			
Rocket launcher	—	73 0 0	62 0 0
20 mm aircraft gun	83 3 10	150 0 0	150 0 0
A.F.V.s:			
Centurion	—	35,000 0 0	38,000 0 0
Aircraft:			
General reconnaissance	44,845 0 0	105,055 0 0	114,695 0 0
A.O.P.	1,090 0 0	2,875 0 0	2,890 0 0
Fighter	9,680 0 0	16,160 0 0	16,720 0 0
Bomber	15,915 0 0	77,600 0 0	89,105 0 0
Transport	45,240 0 0	91,395 0 0	91,550 0 0
Elementary Trainer	1,100 0 0	3,220 0 0	3,220 0 0

The cost figure under the heading of "bomber" presumably refers to a twin-engined light bomber design. Certainly the cost bears no relationship to new jet bombers of the Valiant type. The Royal Air Force no longer employs elementary trainers, the requirement now being for a basic machine of the Provost type; thus the figure for elementary trainers is probably representative of aircraft used in the Reserves, such as the Chipmunk.

SECOND PROTOTYPE of the Hindustan HT-2 trainer, flown on February 19th from the makers' works at Bangalore in the presence of Air Marshal G. E. Gibbs, C.-in-C. of the Indian Air Force. This latest aircraft has a Cirrus Major III engine and a modified tail unit. The first prototype, it will be remembered, was lost during spinning tests last summer.

N.A.C.A. Chief on British Jets

DR. DRYDEN, a director of the National Advisory Committee on Aeronautics, has "no reason to believe that Britain is ahead of the United States on jet-engine development."

He said so at a Congressional private committee meeting—the proceedings of which have since been made public—after the chairman, Mr. Albert Thomas, had stated that the committee had been advised that Britain had the best jet engines, and had also been asked when the U.S. was going to catch up.

Dr. Dryden denied that Britain was "15 to 18 months ahead" of the United States in technical and scientific development on jets, but he agreed that she had begun development two years before America. "We have larger engines going into production at the present time than the British have," he said. "But as far as engines running on the test stands are concerned, United States and British engines are comparable."

Pointing out that British and American specifications were different, Dr. Dryden said the United States demanded a more "severe" performance from jet engines than Britain. British engines taken over by the United States, he said, had had to have certain changes made in their design to meet American requirements.

R.C.A.F. Wings for Lord Alexander

ONE of the last ceremonies at Government House in which Viscount Alexander participated before leaving Canada was his acceptance of R.C.A.F. wings from the Canadian Chief of the Air Staff, Air Marshal W. A. Curtis. In making the presentation Air Marshal Curtis said: "You have flown some 700 hours in R.C.A.F. aircraft of all types—a goodly portion of this time was spent in actually flying the aircraft—not only in Canada and the United States, but in South America, over the Atlantic, in England and on the Continent. We feel that in view of this flying, coupled with what you did in light aircraft during the war, you have earned your wings."

Viscount Alexander has now arrived back in this country to take up his new post as Defence Minister in Mr. Churchill's Government.

They Like Nike

FROM Washington a *Daily Telegraph* correspondent writes that the U.S. Army will soon have a substantial stockpile of "Nike" anti-aircraft missiles; nearly a thousand, he says, should be available by the end of the year. So-called after the Greek goddess of victory, "Nike" is claimed to be able to track down and destroy enemy aircraft at distances up to ten miles.

A B-17 bomber, recently flown by remote control over the White Sands proving grounds at 250 m.p.h. at 30,000ft, was tracked by radar. A pencil-slim "Nike" was projected from its launching platform and locked on a radar beam, eventually transferring from the beam to "final guidance," and when within killing distance of the B-17 the warhead (filled with smoke generating equipment instead of explosive) was seen to detonate. The missile descended by parachute and the B-17 returned to base.

Further Term for General Vandenberg

THOUGH General Hoyt S. Vandenberg completes his four-year term as Chief of Staff of the United States Air Force at the end of April he will not complete the thirty years' service necessary for his full pension until the end of June, 1953; it is therefore announced from the White House that President Truman will ask the Senate to accept the nomination of General Vandenberg for a further 14-month term of office. This would allow the General to finish his service without having to assume an inferior post during the final year.

The arrangement will also defer the difficult decision of selecting a suitable successor; a number of rivals are possible choices, each of whom represents a group with its own convictions of the rôle of air power, and the need for co-operation with the U.S. Army and Navy. It will be interesting, when the question does arise, to see which group eventually carries the day.

Sir Frank Whittle: Commons Questions

IN the House of Commons last Monday, Mr. Wedgwood Benn (Lab., Bristol S.E.) asked the Minister of Supply if the recent criticisms of British jet-engine development made by Sir Frank Whittle were made with his [the Minister's] consent and what steps he was taking to improve development. Mr. Duncan Sandys replied: "Sir Frank Whittle no longer has any official connection with the M.o.S. The first part of the question does not therefore arise. With regard to the second part, I do not consider that these criticisms call for any change in our development policy."

Mr. Wedgwood Benn pointed out that Sir Frank Whittle had been offered a very highly paid post in the United States and was considering accepting it. He asked the Minister, therefore, to consider discussing the matter with Sir Frank "in order to retain the services of this distinguished scientist."

Mr. Sandys said the Ministry were well aware of the views held by Sir Frank as to the advantages of the centrifugal and the axial compressor systems, but that was not a matter which could be discussed at Question Time.

FORMAL ACCEPTANCE: H.E. the Rt. Hon. F. W. Doidge, C.H., M.P., New Zealand High Commissioner, accepts from Mr. W. E. Nixon (right), de Havilland Aircraft managing director, two special Devons for the R.N.Z.A.F. On the left is A. Cdre. C. E. Kay, A.O.C. the London H.Q. of the R.N.Z.A.F. The aircraft are specially equipped radio and navigational trainers, and their interior accommodation and instructional equipment was illustrated in "Flight" of February 15th.

Co-operation in Magnesium

THE increasing use of magnesium alloys in aircraft construction lends interest to the announcement, made last week, that the principal companies of the United Kingdom magnesium industry have formed a consultative and advisory body to be known as the Magnesium Advisory Committee (M.A.C.).

The broad object of the M.A.C. will be to encourage expansion in the production and applications of magnesium and its alloys. Initial activities will be to hold discussions on general policy and technical matters between the member companies, and to serve as the negotiating body with the Ministry of Supply and other Government Departments, with particular reference to the Defence programme.

Membership is open to all companies engaged in the production, casting and or hot working of magnesium or its alloys, with the provision of approval of applications by the committee. Founder members of the M.A.C. are:—

Aeroplane and Motor Aluminium Castings, Ltd., Birmetals, Ltd., Birmingham Aluminium Casting (1903) Co., Ltd., James Booth and Co., Ltd., Bristol Aeroplane Co., Ltd., High Duty Alloys, Ltd., Kent Alloys, Ltd., Magnal Products, Ltd., Magnesium Castings and Products, Ltd., Magnesium Elektron, Ltd., Rolls-Royce, Ltd., Sterling Metals, Ltd., J. Stone and Co. (Charlton) Ltd., Stone-Fry Magnesium, Ltd.

Meetings are for the present being held at Distillers House, St. James's Square, London, S.W.1, and Mr. R. G. Wilkinson, deputy chief metallurgist, Magnesium Elektron, Ltd., Bath House, 82 Piccadilly, London, W.1, is acting as honorary secretary to the committee.

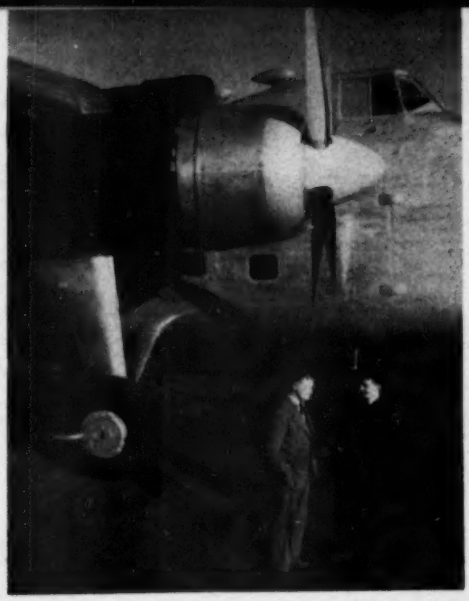
Pest Control's Chairman

THE board of Pest Control, Ltd., announce that Sir Guy Marshall, F.R.S., has relinquished his chairmanship for health reasons; he is to be succeeded by Lord Boyd-Orr, D.S.O., F.R.S.

Sir Guy Marshall, who was founder of the Imperial Institute of Entomology, and its first director from 1913-1942, made a great contribution to entomology by ultimately bringing practical application of research results right on to the farms. He has been chairman of the Pest Control since it was founded in 1939; in ten years it has grown from a small private company to a public company operating on the European Continent, Africa, and Asia, and with a considerable dollar-earning trade with America.

Lord Boyd-Orr is best known for his work as Director-General of the United Nations Food and Agricultural Organization; he was awarded the Nobel peace prize in 1949. He has for some time been interested in the application of science for the control of plant pests and diseases as a valuable means of alleviating the world food-shortage.

HERE AND THERE



THE THIRD of the Bristol Freighters for the R.N.Z.A.F. left Filton recently. Chatting with test pilot John Howman (who flew the New Zealanders on their "conversions"), is F/O. J. Whyte, R.N.Z.A.F.

The American Canberras

GLENN MARTIN are now reported as "almost ready" to start full-scale production of the Canberra at Baltimore.

Cool Millions

THE N.A.C.A. is reported from Washington to have requested a grant of about seven million pounds for the investigation of problems of heat and air friction when aircraft and guided missiles reach speeds between Mach 2 and 3.

Popular Job

SOME 800 applications from pilots in the British Commonwealth are said to have been received by Sabena, the Belgian airline, after they advertised 30 vacancies for captains of DC-6Bs. Sabena pilots earn from £2,500 to £3,500 a year.

Passing It On

BUILDERS of the Westinghouse J-40 turbojet under licence, the Lincoln-Mercury Division of the Ford Motor Co., has lately put out some big sub-contracts, notably one of $13 million to Solar Aircraft for "hot" parts of the engine. Solar, who now have a big new plant at Des Moines, Iowa, are specialists in afterburners, combustion chambers and associated components.

Fifth Louis Blériot Lecture

THE Fifth Louis Blériot Lecture will be held in Paris on Wednesday, March 12th, when Mr. H. Knowler, F.R.Ae.S., technical director and chief designer of Saunders-Roe, Ltd., will lecture on *The Future of the Flying Boat*. The lecture will be in the Salons de l'Hôtel des Anciens Élèves des Écoles d'Arts et Métiers, and will be read in French by Monsieur l'Ingénieur en Chef Benoit, Directeur de l'Office National d'Études et de Recherches Aéronautiques.

Initiative

WHEN the 4,000-ton Australian aircraft-carrier *Sydney* was held up by a dock and tug strike at Perth recently, her captain had a brilliant idea for moving her away from the quay: 12 aircraft were ranged athwartships along the flight-deck and, firmly braked and chocked, run up to full revs. The ship was thereby moved out almost as quickly as by tugs. The *Sydney* is equipped with Fairey Fireflies and Hawker Sea Furies.

Shorter Odds

IN the hope of better weather, this year's R.Ae.S. Garden Party at White Waltham will **not** be held until June. Sunday the 15th is the date now selected.

For Italian Readers

THE well known *Flight* book *Gas Turbines and Jet Propulsion* has already been translated into French, Dutch and Spanish (in addition to a special U.S. edition), and now comes an Italian version, translated by Cap. A. Maglioli. Under the title *Turbine a Gas e Propulsione a Reazione*, it is published at 4,000 lire (paper binding) by Sansoni of Florence.

B-36 Developments

THE Convair works at San Diego are reported to have completed the conversion of the last of over a hundred B-36As and B-36Bs to jet-pod installations outboard of the piston engines. Besides the XB-60 eight-jet, swept-wing successor to the B-36, reports *Aviation Week*, Convair "is grooming another intercontinental bomber replacement entry, probably a turboprop." Possible power units are a turboprop development of the Curtiss Wright J-65 (Sapphire) or of the P. and W. J-57.

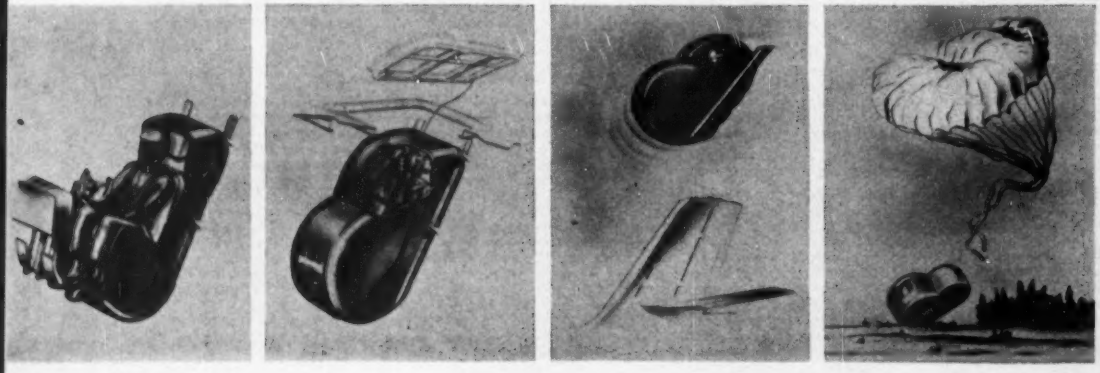
Bookbinding-in-the-Marsh

NEARLY 1,000 U.S.A.F. men a week are now reported to be passing through the reception centre at Guy's Marsh, near Shaftesbury, Dorset. Each new arrival is handed a booklet entitled *Shaftesbury, Gateway to the U.K.*, in which the British way of life is explained.

One Up

THE Canadian Defence Minister, Mr. Brooke Claxton, disclosed last week that Canada has increased her promised air contribution for European defence from 11 to 12 jet fighter squadrons and said they would be overseas by 1954 (two are already in England). Mr. Claxton said 12 squadrons would be operational before enough airfields in Europe were ready for all of them, although negotiations for the first airfield in France were now going on with

PACKAGED PILOT: Sequence of operations for the new ejector-capsule lately developed by the U.S. Navy for high-speed, high-altitude aircraft: (left to right) Pilot pulls "projection" handle and his seat retracts into the capsule, the doors of which close about him; capsule doors lock and hatch-cover is jettisoned; capsule is ejected; and, finally, the parachute is automatically cast off as soon as the capsule touches ground.



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all climatic conditions.
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including gas turbines – it
is advisable to consult Plessey.

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A.3

NOT-SO-CLOSE QUARTERS: Secured—apparently towards sunset—by Mr. Hugh Vasey from a Dove, this intimate study of a Vampire Trainer affords new evidence of its roominess. In point of fact, the cockpit is wider than that of the Mosquito.

HERE AND THERE . . .

the French Government. The increase was agreed on before the NATO Lisbon meeting, but had not previously been announced. The 12 squadrons will form a so-called air division.

Returned—Slightly Damaged

LAST week the island of Heligoland was restored to Germany, after being used by the R.A.F. as a bombing target for the past seven years. An alternative bombing site on the Grosser Knechtsand, a sandbank off the Elbe Estuary, is still the subject of negotiations. Britain once owned Heligoland, but gave it to the Germans in 1890 in exchange for Zanzibar.

Gold in Them Thar Runways

A VETERAN prospector has staked four mining claims on the big airfield under construction for the R.C.A.F. near Val d'Or. "It's good mining land," he said. "I'm not trying to baulk anyone." The situation has been complicated by a further claim, from a mining corporation, to sink a shaft through the runway; when the Federal Transport Department applied last year for a clearance certificate for the site, the corporation—which already had mines on the ground—refused to sign.

Sardinian Jato

THE American Aerojet Corporation, Azusa, California—founded in 1942 by Theodore von Karman, who did much pioneer work in the development of the jato rocket—is one of three concerns interested in the establishment of a new company, General Italjet, in Rome: the other two are Italian—the Whitehead-Motofides Co. (Fiat) and the Stacchini Explosives Works. A factory is to be erected in Sardinia for the manufacture of rocket take-off motors for the Italian and U.S. Air Forces, and it is likely that production will be extended to other aeronautical items.

Tools for the Job

MACHINE tools from Europe—mostly of the large and complex type, by German and Swiss manufacturers—are now installed and working in the P. and W. Division of United Aircraft. The tools were purchased because their makers could quote better delivery dates than U.S. manufacturers.

More Avro Canada Appointments

RECENT appointments at Avro Canada include those of L. F. McCaul as subcontracts manager and of James Jackson and Herbert McDonald as assistant public relations officers under Ross Wilmot. During the war Mr. McCaul was in charge of production at Victory Aircraft, Avro Canada's predecessor. Mr. Jackson served as a liaison officer between the Canadian, British and U.S. Air Forces in both World Wars; in the first he served in the British Army and then the R.F.C., gaining an M.C.

Films for Industry

A CONFERENCE with the theme "Films can Help Industry" is being held by the Scientific Film Association at St. Leonards-on-Sea, Sussex, during the week-end April 4th-6th. The conference fee, exclusive of accommodation, is one guinea: further information can be obtained from Mr. J. Le Harivel, at the offices of the Scientific Film Association, 164 Shaftesbury Avenue, London, W.C.2.

A NOTABLE OCCASION for the Brough Branch of the Royal Aeronautical Society was the recent holding of a "main" lecture at Hull. In this picture of the platform are seen R.Ae.S. officials (left to right) Mr. D. C. Smith, Branches secretary; Mr. N. E. Rowe, Branches chairman; Mr. G. E. Petty, Brough Branch chairman (standing); Mr. George Dowty, vice-president; Dr. A. Ballantyne, secretary; and the lecturers, Mr. K. G. Hancock and Mr. P. Person.

POLES APART: North American operational research in the Arctic Circle, and some small-scale South American flag-waving in Antarctica, keep polar aviation in the news. Left, above, is the view (in spring!) towards Ellesmere Island from Thule, the point on the N.W. Greenland Coast at which a vast U.S.A.F. base has been constructed. Right, having gone rapidly to the other extreme, we see one of the Chilean aircraft (a Chance-Vought OS2U-3 Kingfisher single-float seaplane) lately reported to have been surveying and mail-flying in British-claimed areas of Antarctica, where Argentinian aircraft have also been active. From the north again, the latest news is that S.A.S. are planning a 6,250-mile polar commercial route from Scandinavia to the U.S. West Coast; and on this page is further news of the American Operation "Skijump II."

Probing around the Pole

More News of Operation "Skijump II"

THE U.S. polar Operation "Skijump II" is now getting into full swing, and some further facts are available. The two P2V Neptunes which will be doing the research flying between the Point Barrow (Alaska) base and the North Pole were originally modified for Admiral Byrd's 1949 Antarctic expedition, later cancelled. Since then their special equipment has been tested at the Naval Air Test Center at Patuxent River, and also on the snow-covered municipal airport at Bemidji, Minnesota.

The aircraft are fitted with combined wheel and ski undercarriages, and a number of trial landings are to be made on pack-ice at various points between the base and the Pole. At each site a small automatic homing transmitter will be left, and caches of fuel and other supplies will be made.

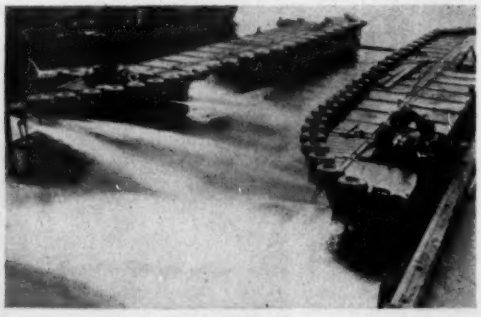
The third aircraft, an R4D—the U.S.N. designation for the Dakota—has already taken part in "Skijump I." This was last year, when, on the last of twelve flights from Point Barrow, the ski-equipped R4D, with ten men on board, was put down on the ice at a point 820 miles from the Pole. In temperatures ranging from 25 degrees below to 30 degrees above zero—during which, incidentally, no cases of frostbite were recorded—personnel learned much about ice characteristics. Before each "roost" on the ice, two precautionary "touch-and-go" landings were made.

When the site had been established, portable chain saws, considered the best means of cutting holes in the ice, were used to permit soundings. During the occupation of an oceanographic station, depth of water, temperature, salinity, direction of current, and bottom samples (where possible) are taken, in addition to ice-thickness measurements.

Ice-thickness is going to be an important factor in the landings by the 65,000 lb P2Vs. Although the "Skijump I" crew proved that 18in of ice would support the 34,000-lb R4D—at least for a short period—they recommended that it be avoided.

The expedition is very much a communal affair. The organizers are the Oceanographic Section of the Geophysics Branch, Office of Naval Research, Washington; the aircraft crews, who are naval, will be housed at the Johns Hopkins University's Arctic Research Laboratory at Point Barrow; some of the aircraft passengers are civilian scientists; Army liaison officers will watch the progress of the expedition; three Lockheed Aircraft engineers will observe the behaviour of the P2Vs; and homing pigeons supplied by the National Zoological Park, Smithsonian Institution, will be released experimentally from the ice-pack bases.

A WATER-BORNE "ELEVATOR" FOR FLYING BOATS



A Martin PBM Mariner enters a new type of floating dry-dock recently developed by the U.S. Navy. The dock is self-propelled along a 600ft submerged cable and can be orientated to suit any wind direction. The aircraft enters between the two pontoons, the ballast-tanks of which are then blown dry, raising the whole structure and its load. The principal value of the dock, apparently, is to assist in manoeuvring flying-boats to moorings in confined spaces rather than to serve as a repair-base. The smaller illustration shows the ballast-tanks being exhausted.

ABOUT THE AIR ESTIMATES

R.A.F. Housekeeping, as Revealed for the Taxpayer's Enlightenment

CONSTITUTING a substantial book (published at 6s 6d by Her Majesty's Stationery Office in London) *Air Estimates*, 1952-53 is similar in format to its predecessors of recent years. At first glance most of it appears to consist of rather dreary lists of votes, tables of figures, and explanatory notes and enlargement under a great number of headings. We venture to suggest, even so, that almost any ordinary person who sits down to examine these Estimates for half an hour will find a great deal of factual information of interest, together with enough detail in the break-down of the administration, provisioning, and expenses of a great fighting Service to occasion wonder and surprise.

Air Estimates for 1952-53, figures for which are tabulated (right) under main headings, are based on an estimated number of officers, airmen and airwomen of 315,000. The break-down of this figure is also given in tabulated form below. It will be noted that the Estimates are submitted under 11 main headings, or Votes. As might be expected at a time of expansion and rising prices, nearly all the Votes show a marked increase over the previous 12-month period. Vote 1, for example, which is concerned with Pay, is £10,250,000 up on the 1951-52 period. This is mainly due to higher average strengths of officers and airmen, and increased rates of local overseas allowance, and outfit and tropical kit allowances.

It is interesting to note that an increase in the figure for Appropriations in Aid (i.e., incoming moneys and other credits to be set against gross estimates of expenditure to give the net estimate figure) of £2,520,000 is due to the higher number of personnel on loan or serving with international defence organizations whose services are paid for (or repaid) by the Ministry of Defence. Details of kit and other allowances are contained in one of the explanatory notes dealing with Vote 1, and the total figure is £825,000 compared with £330,000 for the previous period.

Reserve and Auxiliary Forces are dealt with in Vote 2, and here again there is a small net increase of £410,000. £98,000 was paid to personnel called up for training under the Reserve and Auxiliary Forces Training Act of 1951, and indirectly this accounts for the fact that one of the few decreases—£4,000—is to be found under the heading of "Pay for R.A.F.V.R. Personnel."

Vote 3 is concerned with Air Ministry expenses, and the total estimate of £3,900,000 is an increase of £722,000 on the previous period. It covers salaries and wages of the Air Council and their personal staff (the Secretary of State, incidentally, is one of the Ministers who had his salary reduced by £1,000 to £4,000 when the new Government came into power), and the salaries of all the departments of the Chief of the Air Staff and of Air Members, and so on. One example of the less well known services covered by the Air Ministry's expenses is the headquarters of the Meteorological Office. The work of the Meteorological Office includes the provision of services for Royal Air Force, Army, civil aviation, Government departments, local authorities, and others. It also includes the administration of British ocean weather ships and research in meteorological and geo-physical subjects. Salaries for this H.Q. total £197,000 in the Estimates.

To obtain a full picture of the meteorological services it is necessary to turn on to Vote 4, concerned with civilians at out stations, for some 2,032 meteorological staff are in this category, compared with 295 at headquarters, both figures being for the 1952-53 period. Their salary figure is estimated as £1,184,000.

MAXIMUM NUMBER OF OFFICERS, AIRMEN AND AIRWOMEN

	1952-53			1951-52		
	Officers	Airmen and Airwomen	Total	Officers	Airmen and Airwomen	Total
Royal Air Force	32,100	263,600	295,700	24,500	229,300	253,800
Princess Mary's Royal Air Force Nursing Service	450	—	450	350	—	350
Women's Royal Air Force ...	700	10,650	11,350	600	10,300	10,900
Local forces abroad ...	50	5,700	5,750	50	3,450	3,500
Other Commonwealth air forces ...	400	1,350	1,750	300	1,150	1,450
Total ...	33,700	281,300	315,000	25,800	244,200	270,000

ABSTRACT OF AIR ESTIMATES, 1952-53

Vote	Service	Estimates 1952-53	Estimates 1951-52	Differences of Net Estimates	
A	Max. number of Officers, Airmen and Airwomen to be maintained for Air Force Service	315,000	270,000	Increase 45,000	
		Net Estimate	Net Estimate	Increase	Decrease
		£	£	£	£
1	Pay, and etc. of the Air Force ...	87,250,000	77,000,000	10,250,000	—
2	Reserves and Auxiliary Services ...	1,979,900	1,569,900	410,000	—
3	Air Ministry ...	3,900,000	3,178,000	722,000	—
4	Civilians at Out-stations	26,120,000	22,422,000	3,698,000	—
5	Movements ...	11,900,000	8,650,000	3,250,000	—
6	Supplies	66,200,000	40,105,000	26,095,000	—
7	Aircraft and Stores	191,000,000	132,790,000	58,210,000	—
8	Works and Lands	73,440,000	37,500,000	35,940,000	—
9	Miscellaneous Effective Services	2,130,000	1,490,000	640,000	—
10	Non-Effective Services	3,720,000	4,045,000	—	325,000
11	Additional Married Quarters ...	100	100	—	—
	Totals	467,640,000	328,750,000	139,215,000	325,000

Under Vote 5, devoted to Movements, the net estimate is £11,900,000, an increase of £3,250,000 over the previous period. This figure provides for the movement of personnel and stores by means other than by Service aircraft and vehicles. The increase in the gross total is mainly due to higher strengths of officers and airmen, increases in rail fares, passage rates, and freight charges, and a greater volume of stores and supplies to be moved by rail and sea. The figure in Appropriations in Aid is reduced this year mainly (according to the explanatory notes) because of the discontinuance of recovery from other Defence departments for passages in R.A.F. aircraft other than for special flights.

Conveyance of personnel, travelling allowance, and expenses are sub-divided into rail and short sea journeys, road journeys, sea passages, and air passages. The term "short sea journeys" means to islands around the U.K. mainland and Ireland.

In the current year £700,000 is allowed for air passages as compared with £460,000 for 1951-52. These passages cover Service personnel and civilians required to travel on urgent duty journeys. They may either be conveyed by civil airlines at commercial rates, or civil aircraft may be chartered at competitive rates for trooping movements and for conveyance of families, or in the case of relatives visiting Service personnel or civilian staff dangerously ill abroad, outward air passages may be provided at public expense.

Under the heading Conveyance of Stores, it may be noted that an allowance for air freight for the current year of £50,000 is £30,000 less than for the previous period. Presumably this indicates that fewer stores and less official mail is expected to be conveyed in civil aircraft (chargeable at commercial rates) in the coming 12 months.

Among the Appropriations in Aid concerned in Vote 5 it may also be noted that recoveries for conveyance in R.A.F. aircraft are estimated at only £100,000 compared with £385,000 in 1951-52. This sum covers in the main charges for flights specially provided for other Defence departments.

A somewhat remarkable increase is noted in Vote 6 for supplies. Under Section C, Liquid Fuels, Lubricants, etc., the estimate for 1952-53 is £45,750,000 as compared with £25,165,000 for the previous 12-month period. Thus the increase is £20,585,000. The explanatory note indicates that the overall increase under the Supplies Vote, namely, £26,095,000, "is mainly due to higher strengths of air force personnel; higher costs of supplies generally; increased requirements of liquid fuel for current consumption; and increased provision for duty payable on aviation fuel (including duty on a new fuel to be used in place of a non-dutiable fuel)."

Not only aircraft but mechanical transport vehicles, marine craft, weather ships, auxiliary vessels, station plant, heating, lighting and cooking, are included under the Liquid Fuels, Lubricants, heading. Also included is the provision for the cost of producing aviation fuel from heavy oil at a plant in the U.K. The fuel is produced under an Air Ministry contract and is purchased from the Air Ministry by oil companies for distribution.

To many readers of *Flight*, Vote 7, for Aircraft and Stores, will be the most interesting. Comparative figures showing increases

ABOUT THE AIR ESTIMATES . . .

for the first five items A to E are tabulated together with the break-down of the aircraft figure for which the total is £111,000,000 compared with £81,000,000 in 1951-52. Compared with the figure for aircraft, other supplies account for comparatively small sums, the largest being £29,000,000 for armament, ammunition and explosives. The net increase under Vote 7 is £58,210,000 due, it is explained, to the continued expansion and re-equipment.

AIRCRAFT AND STORES

		Estimates		
		1952-53	1951-52	Increase
		£	£	£
A	Aircraft	111,000,000	81,000,000	30,000,000
B	Armament, Ammunition and Explosives	29,000,000	17,600,000	11,400,000
C	Radio, Radar and Electrical Equipment	21,000,000	12,340,000	8,660,000
D	Instruments and Photographic Equipment	8,000,000	5,870,000	2,130,000
E	Mechanical Transport Vehicles and Marine Craft	15,010,000	10,900,000	4,150,000

It should be explained that the heading "Aircraft" in the table below refers to the supply of airframes and to their repair. Aero engines complete are covered by their heading, i.e., component parts, accessories and spares are included. "Airframe spares, components, accessories, etc." provides for airscrews, gun turrets, radiators and oil coolers, ejection seats, jettisonable fuel tanks, aircraft dinghies, airborne targets, and equipment for modification and reconditioning by contract.

AIRCRAFT ESTIMATES

		1952-53	1951-52
		£	£
1	Aircraft	44,500,000	35,600,000
2	Airframe spares, components, accessories, etc.	25,880,000	21,990,000
3	Aero Engines	40,620,000	23,410,000
		111,000,000	81,000,000

Works and Lands are the subject of Vote 8 under which there is a net increase of £35,940,000 this year. New works, additions, alterations, repairs, purchase of lands, rents and service are all variously listed under the heading.

Work in hand and proposed is described in some detail in the explanatory notes to Vote 8, but in general it may be said that the increase in the Vote is due to the provision or extension of airfields, barracks and messes, and technical facilities. In particular, progress on the development of the radar chain and the maintenance of a larger number of airfields, is mentioned.

Under the heading of Miscellaneous Effective Services, Vote 9, is to be found "Training outside the Royal Air Force," for which a sum of £1,550,000 is provided. This is an increase of £500,000 over the previous year, and of the total £1,493,000 goes to training by civil flying companies. Almost the entire increase under the heading, in fact, is to go for this training which, of course, particularly concerns the R.A.F.V.R.

The last two Votes concern Non-effective Services (10) and Additional Married Quarters (11). An unexpected balance at April 1st, 1952, results in the net estimate of only £100 under the final Vote 11 which covers a start on the construction of up to 4,000 married quarters during the year and progress on others.

THE NAVY ESTIMATES

THE Navy Estimates, 1952-53, is a document closely comparable with the Air Estimates reviewed above, and was published at the same time by Her Majesty's Stationery Office, price 8s. In these Estimates, Votes are made under 15 headings. Intentionally, no doubt, little detailed information can be gained from Vote 8, which is devoted to ship-building, repairs and maintenance, and which includes the building of aircraft. The total Vote for ships and aircraft (contract work) is £76,038,000 compared with £48,715,000 for the previous period, and included in this figure is £16,410,000 for aircraft and repairs (compared with £13,768,000 for 1951-52).

There is an increase of £2,332,000 for scientific services (vote 6).

Vote 10 of the Navy Estimates concerns works, buildings and repairs at home and abroad, and from the Airfields, Home, subsection under this Vote it appears that no new airfield works are to be started in 1952-53, although a figure of £2,391,500 appears under the heading of "Works started in Previous Years."

SUPPLEMENTARY ESTIMATES 1951-52

SUPPLEMENTARY Air Estimates for 1951-52 were published at the same time as the Estimates for the current year. These show a net increase in total net expenditure of £3,300,000 and a net increase in total Appropriations in Aid of £1,500,000, and thus the Supplementary Estimate is £1,800,000.

From the details and explanation it is learned that the Supplementary Estimates provide for maintenance of additional numbers of personnel and for further expenditure consequent upon special measures taken to strengthen the R.A.F. in accordance with the House of Commons' announcement of January 29th, 1951. Increases in prices and improvements in pay and allowances for Air Force and civilian personnel, also circumstances that involved increased movements of personnel, stores and supplies, are mentioned in connection with the increased expenses.

The revised Estimate for maximum numbers of officers, airmen and airwomen to be maintained in fact showed an increase of 15,000 over the original Estimate. On the other hand, however, nearly half of the increased gross expenditure will be offset by what are described as savings due to expected short falls in the delivery of certain aircraft and stores. Some details of the value of these short falls are : aircraft, £4,150,000; armament and explosive stores, £4,700,000; radio, radar and electrical equipment, £3,700,000; instruments and photographic equipment, £870,000; mechanical transport vehicles and marine craft, £3,300,000. Though not unexpected, these shortfalls, indicative of slow progress, are no less unfortunate.

Part of the increases—£400,000—arises from the call-up of Reserve and Auxiliary officers and airmen who numbered 7,500.

SELECT COMMITTEE REPORT

LAST week there was also published the Second Report from the Select Committee on Estimates, Session 1951-52 (H.M.S.O., price 1s. 3d). From the introduction it is learned that four trade associations—the Society of British Aircraft Constructors, Ltd. the Radio Industry Council; the Society of Motor Manufacturers and Traders, Ltd.; and the Machine Tool Trades Association—have reported that the supply of general labour is easier, though in the aircraft industry there are difficulties in some districts where housing is short. The shortage of skilled workers remains serious. Remedies mentioned by the Ministry of Labour and National Service included development of schemes of training; up-grading; and dilution by different industries.

Machine-tool makers (and motor manufacturers) have both reported greater wastage than recruitment. There seem to be signs of competition for skilled labour between them. There continues to be a general shortage of professional scientific and technical staffs, although this is less marked in War Office and Air Ministry establishments.

The shortage of machine tools does not itself appear to be such a serious handicap to the present phase of the rearmament programme as seemed probable last year. This, however, is due to the occurrence of other shortages, namely, those of materials and labour. In the view of the S.B.A.C., deliveries of American machine tools are badly behind-hand, but otherwise (since the whole rearmament programme, as it affects the Society, has slowed down) the provision of machine tools is reasonably satisfactory. Both the S.M.M.T. and the S.B.A.C. stated that their members were "working from hand to mouth" where materials were concerned.

The M.o.S. and the three Service departments stated that more storage space would be required as the rearmament programme proceeded. The Air Ministry are not planning new buildings, but propose this year and next to rehabilitate existing sheds and hangars to increase their storage space by 1½ million square feet at a cost of £1 million.

Appendices provide more detailed information; for example, practically all the additional workers required for aircraft construction will have to be recruited from other industries. The increase of 21,400 in the labour force in the 1950-51 period was appreciable, but the unfilled vacancies (8,405) show that the build-up is not fast enough. The labour problem is aggravated by the high proportion of skilled workers required and the fact that the demands fall in areas already overloaded with other important work.

Figures (from Appendices 7 and 8) concerning delivery times and costs are printed in the news section on a preceding page.

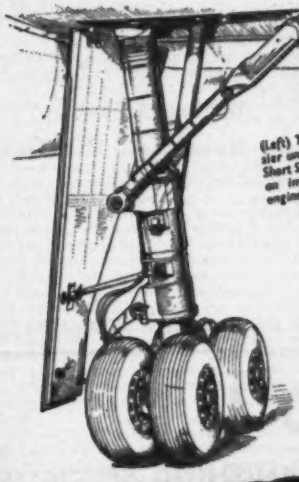
In Appendix 11, devoted to the aircraft programme, five witnesses from the aircraft industry gave further answers to questions, from which has been compiled a joint memorandum. Of recruitment of professional and technical staffs, this states that the long-term solution lies in two directions : increasing the out-turn of such staff and using them more economically. To increase the out-turn means more training capacity; more economical use means that the present inflationary demand for professional and technical staff must be damped down. There might be duplication in the technical teams maintained by M.C.A., B.O.A.C., and B.E.A., in addition to those in the M.o.S. and the industry itself. In the short term, the only way to aid the priority industries is by robbing others.

On the subject of material shortages, it is agreed that steel and alloy steel supplies are erratic, and that production is being held up. Companies are seriously embarrassed by long delays in obtaining a Ministry decision and licences for new buildings.

The radio industry report that the supply of professional and technical personnel and skilled man power does not begin to approach demand.

MESSIER *Landing Gear*

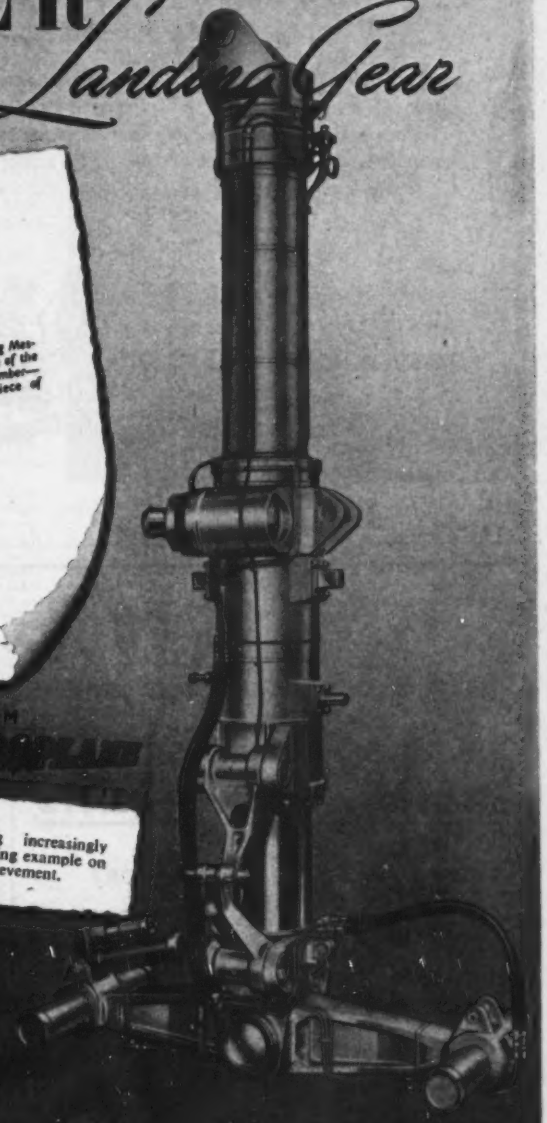
FROM FLIGHT SEPT. 21ST 1951



(Left) The towering Messier undercarriage of the Short S.A.4 jet bomber—an impressive piece of engineering.

FROM FLIGHT

Bogie-wheel undercarriages are becoming increasingly common at Farnborough, and the inward-retracting example on the Short SA.4 is a magnificent engineering achievement.



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WINDS in the IONOSPHERE—

— *and Their Effect on Radio Transmission. Results of a Three-nation Research Programme*

ONE of the causes of fading in radio communications is a wind phenomenon in the ionosphere. Winds of the upper atmosphere are produced by the heating effect of radiations from the sun and by solar and lunar gravitational tides. Because knowledge of their motions is necessary for correct evaluation of the role of ionization, de-ionization, and diffusion process in the upper atmosphere, the U.S. National Bureau of Standards has incorporated a study of winds in its ionospheric research programme.

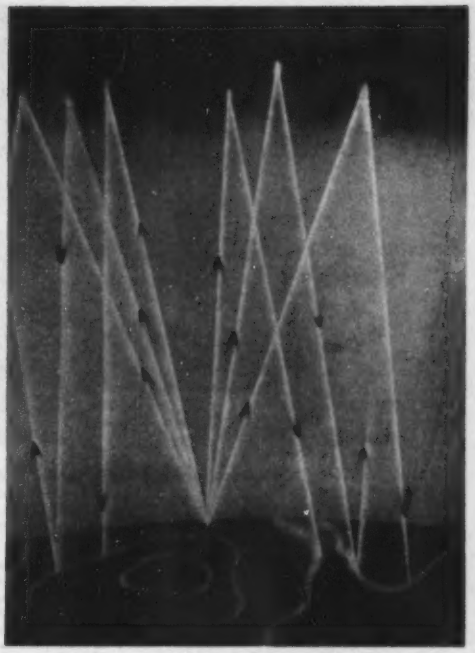
The Bureau's observations of ionospheric winds (writes a U.S. correspondent) are made on a regular monthly schedule, and the data are co-ordinated with similar observations made by scientists in Great Britain and Canada. The agreement that has been obtained between the records of the three participants suggests the possibility that the observed winds belong to a world-wide circulatory system of the outer atmosphere.

Analysis of the results indicates that the azimuths of the winds are subject to seasonal variations. During June, July and August the winds blow principally to the east; in December, January and February their direction is generally south-westerly. During the spring and autumn, the winds often appear to rotate in a clockwise sense, completing two complete rotations in a 24-hour period. Speeds are also subject to variations; some are as high as 300 m/sec (660 m.p.h.), but the average is about 70 m/sec (150 m.p.h.).

In the past, ionospheric-wind characteristics have been calculated from observations of slowly drifting meteor trails and luminous clouds occasionally seen during the night hours. However, because the data are derived from relatively rare phenomena, this method is not capable of giving a comprehensive picture of upper atmosphere winds. At present the Central Radio Propagation Laboratory of the Bureau is using a systematic technique that takes advantage of the reflecting property of the ionized layer of the upper atmosphere, upon which all long-distance radio propagation depends.

When radio waves of constant amplitude are reflected from the ionosphere back to the earth, they usually return with an amplitude that varies erratically with time. The variation or fading of the radio signal is generally a nuisance factor in long-distance communications, but aptly lends itself to an investigation of ionospheric winds.

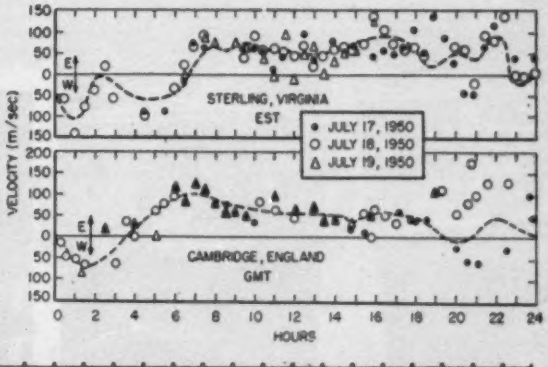
If the fading is observed at two receiving aerials separated by one or two wavelengths of the probing radio waves, the fading patterns are very similar, but often appear displaced in time. This time delay can be explained by assuming that the ionosphere is made up of patches of ionization; in other words, that some parts of the ionosphere are more densely ionized than others. For this reason, the radio waves that are scattered or reflected from the ionosphere produce a "diffraction pattern" of signal intensities on the ground. Thus, as the overhead layer of the ionosphere moves, the ground pattern also moves and the fading sequence appears first at one aerial and then the other.



Pictorial representation of the way in which the moving ground-pattern of reflected signals is plotted by three receivers in triangulation.

The time delay between the arrival of various parts of the fading pattern at the two aerials will depend on the speed of the movement. The direction and speed of the motion can be determined by locating three aerials at the corners of a triangle, and then employing triangulation principles. The ground pattern moves twice as fast as the ionosphere irregularities which give rise to it.

The new ionospheric-winds equipment is located at the Bureau's radio-propagation field station at Sterling, Virginia. It consists of a transmitter operating at 2.3 Mc/s and three receiving aerials and their associated receivers. The transmitter produces 200-microsecond pulses, with a peak power of 10 kW, at a rate of 60 per second. The receivers are gated to respond only to those pulses that have been singly reflected from the ionosphere.



(Right) Comparison between data obtained at the Sterling, Va., station and the Cavendish Laboratory (Cambridge) field-station in this country. Measures of agreement such as these shown here lend support to the theory that the inonospheric winds may have a world-wide circulatory system.

(Below) A typical record obtained at the Sterling station. The ground diffraction pattern is first intercepted by one aerial (voltage reading shown by solid line) and about 2 sec. later by the other (dotted line). The "pegs" are 4-sec calibrations.

Another International Airport

Facilities at Friendship Field, one of the Largest in the United States

The main administration building at Friendship: the central tower—"as high as a nine-storey building," which sounds undesirable—is surmounted by the control room. "Parking lots"—marked out in herringbone divisions—cover a large area in the background.

FRIENDSHIP International Airport is situated on the Atlantic coast of the United States, in Anne Arundel County, Maryland. Baltimore is only five miles to the north, while Washington, D.C., is less than twenty miles to the south-west.

History of the project dates from 1943, in which year the then Mayor of Baltimore finally decided that Harbor Field was quite inadequate for use as a major traffic centre, and appointed a committee to find a new site. Since that time, a new city charter for Baltimore has resulted in the creation of a City Department of Aviation headed by an Airport Board. This board adopted an overall plan drawn up jointly by two of the leading Baltimore engineering organizations. To meet the cost of the airport, two bond issues, each of six million dollars, were voted, to which the Federal Government added three million, and the State of Maryland $400,000 for access highways.

The site is some 140ft above sea level, covers some 3,200 acres, and is surrounded by flat country; no building over 130ft in height may be constructed within a wide radius. Test borings revealed clay deposits beneath the proposed runways; in order to provide drainage 300,000 cu yd of this white clay was removed, for a distance of 500ft either side of each runway. A saving of some three million dollars was made by the novel method of compacting the subsoil beneath each runway by rolling it, and for this purpose a rubber-tyred vehicle weighing 200 tons was employed.

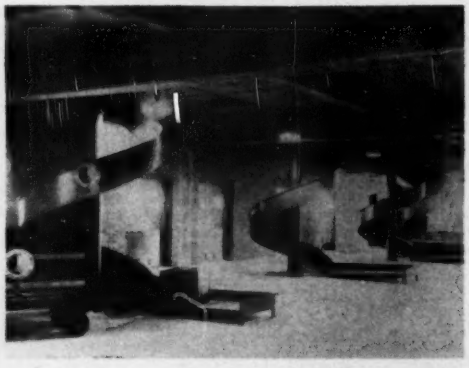
With a present capacity of 60 aircraft per hour, the runway system comprises a 9,450ft instrument-runway, 200ft wide, and slightly narrower strips of 6,500 and 6,000ft. The emergency equipment is situated at the intersection of the three runways; such an arrangement is unusual, but does have the merit of reducing the average time over a number of runs to emergencies.

The terminal building, on which $3,724,000 was spent, is well worth study as being representative of the newest American practice. Passengers are handled upon a lower or upper floor level according to whether they are incoming or outward bound; baggage is handled at an even higher level, and is delivered to passengers by chutes and conveyors. Overall floor area is given as 175,000 sq ft, while the building embraces such useful appendages as banks, barber shops, ticket counters, restaurants and meeting-rooms, and even a "flight-seeing" promenade and terrace for dancing. An especially interesting feature is the provision of twenty-two air-conditioned "roomettes" on the mezzanine floor of the terminal building. They are placed at the disposal of passengers waiting for a connecting service, and are equipped with a bed, dressing-table and shower.

The very full ground equipment includes usual radio aids, as well as surveillance radar and I.L.S., while G.C.A. was due to be installed by the end of last year. The site averages only five foggy days per year. A 24-hour weather service is maintained.

Operating through Friendship International Airport at present are Eastern, National and Capital Airlines, together with numerous smaller carriers—notably Seaboard and Western, the non-scheduled freight company.

Full provision for expansion has been made, in order to meet the expected increases in traffic.



Friendship Airport is one of the largest in the United States, having five times the area of Washington National Airport, and four times that of La Guardia Field, New York. The view on the left was taken looking along the 9,450ft instrument runway towards Chesapeake Bay. (Below) In the terminal building, baggage is handled at an upper floor level and delivered by these spiral chutes.

Power potential

In its progressive programme of power development the Armstrong Siddeley Sapphire—the most powerful aircraft engine in the world—has completed a 150 hours type test at a rating of

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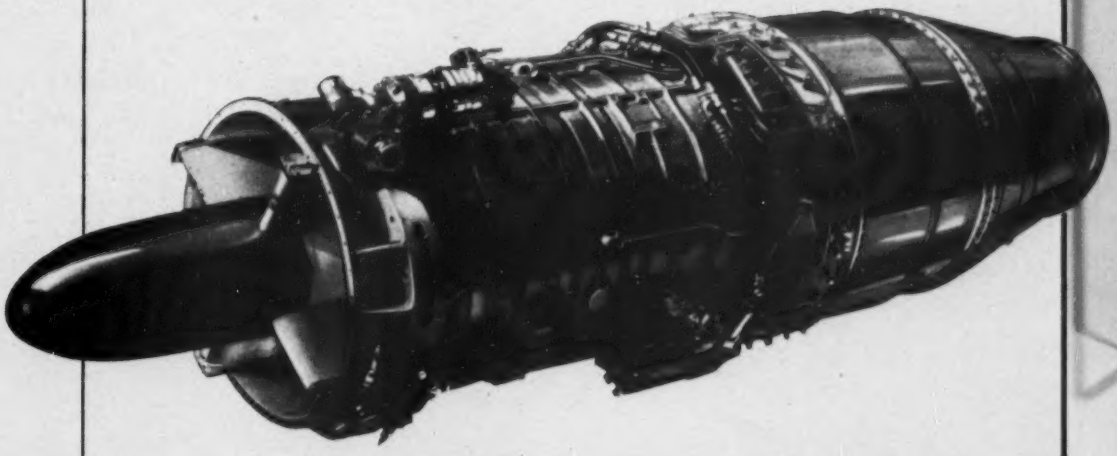

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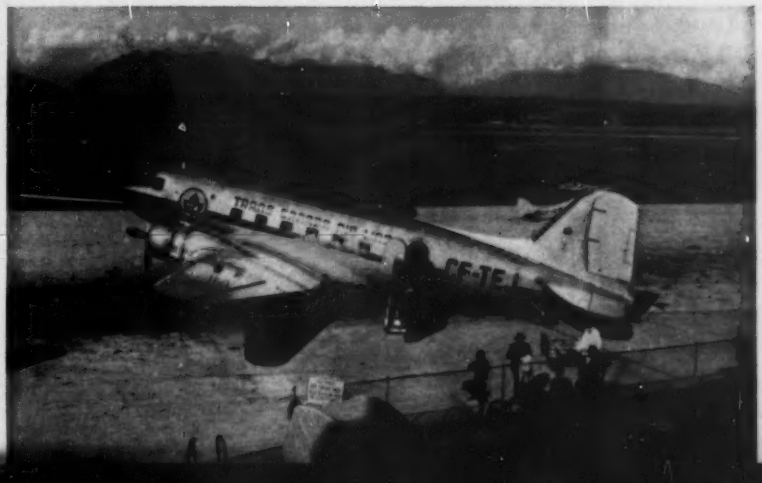
DE HAVILLAND

A Trans-Canada Air Lines' DC-3 over Quebec City, with the Citadel high above the St. Lawrence in the foreground; the tall building beyond is the Château Frontenac.

IN addition to the Trans-Canada Air Lines' trunk routes flown by Canadair North Star Skyliners, there are many secondary routes operated by the company's fleet of DC-3s which link the Province of Quebec with the Maritimes and Newfoundland and Vancouver with Victoria and Seattle. Other DC-3 services radiate from Toronto and there is a prairie route between Winnipeg and Edmonton to Alberta *via* such intriguingly named towns as Swift Current and Medicine Hat.

MAPLE-LEAF DC-3s



(Above, *left*) *A DC-3 of T.C.A. flying over the typical flat, wooded landscape of the Eastern Provinces.*

(Above, *right*) *Steel mills form the background to this DC-3 flying over the narrows at Sault Ste. Marie, on the U.S.-Canadian border.*

(*Left*) *Passengers embarking on a T.C.A. DC-3 at the Vancouver International Airport on Sea Island, by the Fraser River.*

For flow tests of the fuel system, the static prototype was held at various attitudes such as might be found in sustained flight. e.g., 15 deg climb, 3 deg dive, both straight and with 3 deg roll port and starboard.

NON-FLYING PROTOTYPE

Introduction of a Development Method Likely to Become Standard Practice in the Future

By THE TECHNICAL EDITOR

PRIMARILY because of the re-armament programme, but not wholly so, the subject of aircraft production has exercised a good deal of attention of late. True, the attention has been directed from many viewpoints—national safety, time, labour availability, money, materials, floor space, and so on—but when all's said and done, the root of the whole matter devolves on one fact: the complication of modern aircraft and engines. Worse, all the ancillary elements which contribute to aviation as a whole reflect the common trend toward greater complexity.

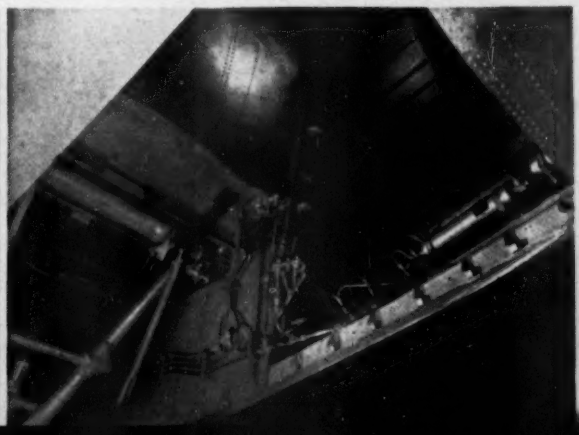
It is, of course, useless to rail against this trend; aviation only expresses in an acute form a symptom of a world condition. Equally, it is useless effetely to resign ourselves to the condition without making an attempt to alleviate some of the difficulties. So far as aviation is concerned—or more accurately the aircraft production element of aviation—the problem of producing aircraft quickly can be resolved into two main issues: (i) design and prototype development, and (ii) line production.

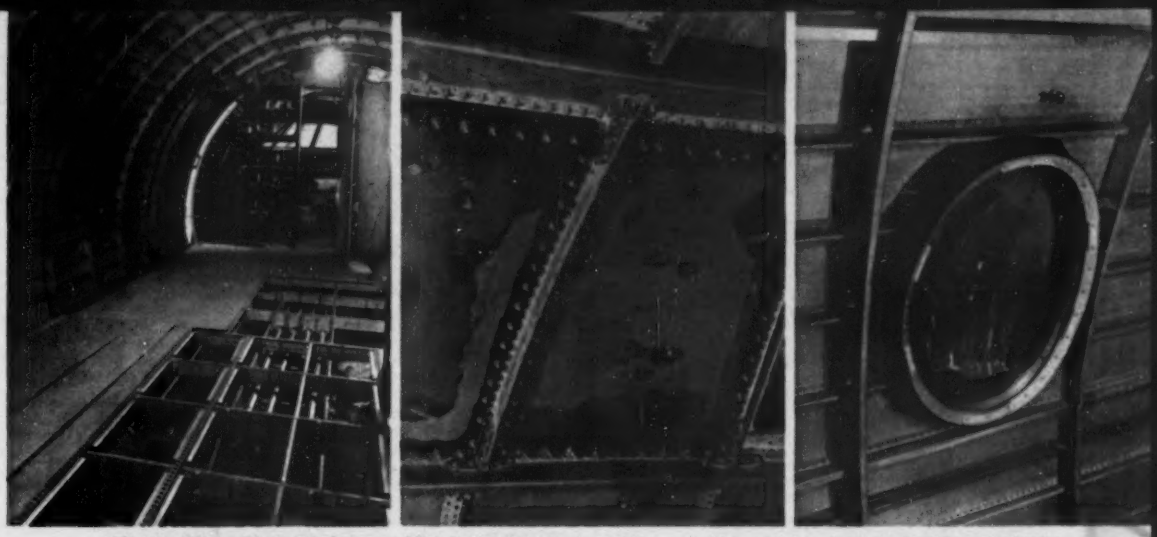
Of these, line production involves problems which, although by no means slight, have the advantage that they are fundamentally of a mechanical and organizational nature, and are thus amenable to rational treatment. The problems of design and prototype development, however, are different; by the very nature of the subject it is implicit that no little empiricism is involved—and always will be—but, nevertheless, because the methods of attack on these problems have become, by common usage, almost traditional, it is safe to say that scope exists for revised thinking. More, so aggravated has the time and cost aspect become that the writer firmly believes that a new approach *must* be made. The time interval between drawing board and first flight is far too long, measured against the time taken for the aircraft to get into service and the span of its first-line service life. Design and prototype development time must be shortened.

That a gradual awakening of the import of this premise is taking place is indicated by the work being done with dynamically-similar models by Convair, and the construction of a non-flying prototype of the 175 Britannia by the Bristol Aeroplane Company. Each of these methods of attack contributes to an effective shortening of development time: there may well be room for additional improvement by wedding the methods together. First, a conclusive design study; second, tunnel tests; third, flight tests with remotely-controlled dynamically-similar powered models; fourth, a full-size non-flying prototype together with structural tests; fifth, production. This, in broad outline, is how the writer sees the pattern of embryonic development in the future. It is incomplete, cannot be hard and fast, and must be modified to circumstance—but broadly it offers a way to cut down time and cost, and some such method, if not this one, will have to emerge before long.

There is, of course, a primary factor in all this which,

These photographs of (left) the wing leading-edge root and (right) the interior of the nosewheel well, together indicate unmistakably that the non-flying prototype is more than a mock-up: it is a real aircraft which will never fly, yet which serves as a fiducial proving ground for its flying successors.





(Left) View of forward fuselage, looking toward flight deck and showing floor-supporting structure, control runs, and the ingenious seat-mounting rails. (Centre) The edges of the Perspex windscreen panels are notched for attachment by myriad through-bolts. (Right) The cabin windows are dry-air sandwich structures, glazed in Perspex, the outer panel being of single curvature, whilst the inner panel is doubly curved.

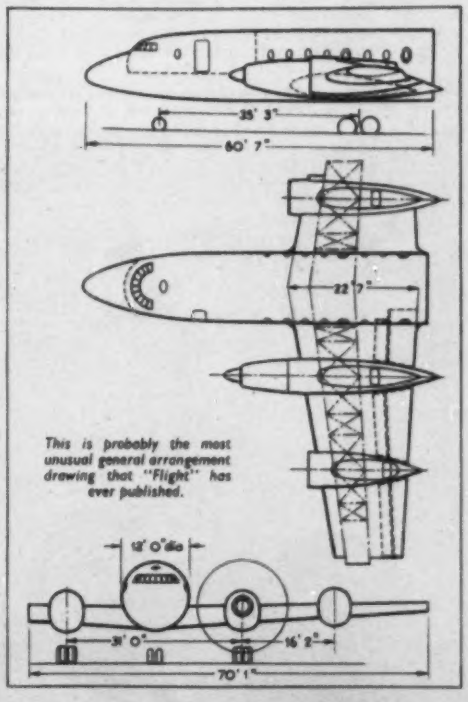
although vital, is nebulous; it is decision. No matter how effective a time-saving method may be, it will be brought to nought if the authority concerned will not make up its mind sufficiently in advance. But dilatoriness in high places does not constitute an excuse for neglect of the introduction of methods for speeding-up development. It is not a matter for equivocation; equally, it is not something about which a directive is likely to be officially issued. The steps must be initiated, as they must be taken, by the manufacturers themselves.

The Bristol Aeroplane Co., Ltd., decided in 1948 to shorten the initial development of the 175 by making use of a non-flying prototype. Had they been given the green light then, Britannias could today have been in service; not such advanced and versatile Britannias as B.O.A.C. will now have (it is so tempting to wait a bit longer for that something better the aircraft designer always has to offer) but, nevertheless, good, efficient British aircraft to fly British routes. In the event the 175 was chopped and changed about to match new thoughts on operational requirements, and so the months piled up into years. Now, however, the Britannia has been stabilized as a design and production has started. First flight of the prototype is but a few months away, and the rapid execution of the initial development period is in no small way due to the non-flying space-model.

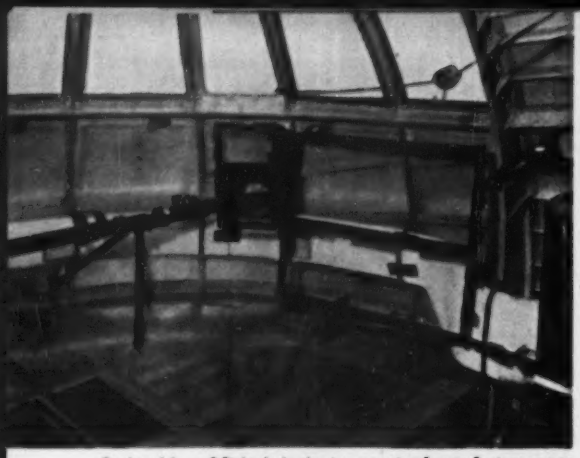
What is this non-flying prototype and, more important, why is it? It is a full-scale, "three-quarter" model of the Britannia, built from the normal prototype drawings, and identical in every necessary respect to the genuine aircraft. The quoted term "three-quarter" model is used to indicate that, as may be seen from the illustrations, the complete airframe is not used. The reasons for the existence of the N.F.P. are diverse and numerous. Initially it was conceived as a means whereby all preliminary functioning tests of ancillary service systems could be conducted, so saving the time normally spent in this work on the first (flight) prototype. In the event, the N.F.P. has proved to be exceedingly useful in a number of ways which were not clearly foreseen at first.

The space-model element is of first importance in relation to the physical installation of systems, e.g. hydraulics, cabin conditioning, electrics, and so on, as well as for primary and secondary control transmission runs. In this connection maintenance accessibility can also be accurately assessed. Quite aside from the dimensional aspect of a system installation, however, is its functional practicability. To take hydraulics as an example, it is common practice for the several components of a system to be individually tested by the makers preparatory to conducting a functional test of the system as a whole on a test rig. This is sound practice as far as it goes, but no one could reasonably suggest that a test rig provides exact duplication of the final installation. Having an airframe in which the system can be faithfully installed and operated, however, not only obviates the necessity for a complicated and expensive test rig, but permits an assessment of the system's functional quality to be derived in a manner and to a degree matching virtually exactly the definitive installation.

It might be thought that the time and materials devoted to the construction of a static prototype might equally as usefully and more economically be employed in building the first flight prototype. But because an N.F.P. has the advantage of so many short-cuts, it must always be completed in advance of the first flight prototype, even if they start



This is probably the most unusual general arrangement drawing that "Flight" has ever published.



Starboard bow of flight deck, showing mounting frames for instruments and controls and the light yet strong resin-bonded glasscloth ducting.

NON-FLYING PROTOTYPE . . .

level. In the Bristol case, the N.F.P. is built from materials which are not all as laid down in the 175 design specification. Use has been made wherever possible of the first-off tool-proving components (which are normally scrapped) and, in the main, gauges and material dimensions have been held.

Inspection procedures, whilst not obviated, have been justifiably relaxed, snap-head rivets have been used in place of countersunk heads, and numerous other detail laxities have been indulged in where their application is not critical. It was foreseen, however, that the relaxing of the high standards normally demanded might conceivably lead to a diminution of workmanship integrity in the assembly of production aircraft. Thus the standard of inspection and the general structural leniency allowed on the non-flying prototype were not permitted to lapse too far from the normal. Another aspect of the usefulness of an N.F.P. is that the men who have built it form a trained nucleus possessing first-hand experience which is invaluable in leading the assembly teams who are building the production aircraft. So far as Bristols are concerned in this context, it is not that the labour is poor, rather is it that the aim of the company is to produce an aircraft with the best finish yet seen.

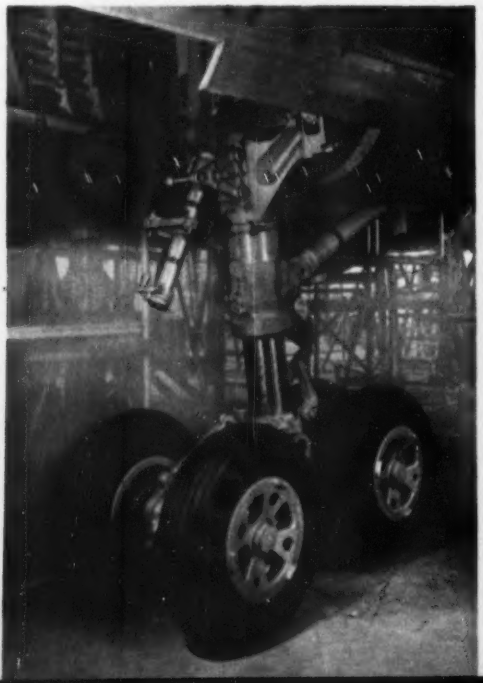
On the score of usefulness, perhaps the most concise and comprehensive method of stating the scope of the non-flying prototype Britannia is to list the schedule of equipment and furnishings embodied. It should be noted that the port wing extends only to the outboard limit of the flaps, whilst the starboard wing extends only to a short distance outboard of the inboard nacelle. By the same token, the fuselage extends only just abaft the wing trailing edge root. In the list of equipment, the component or system sub-assemblies should be taken as complete unless otherwise stated.

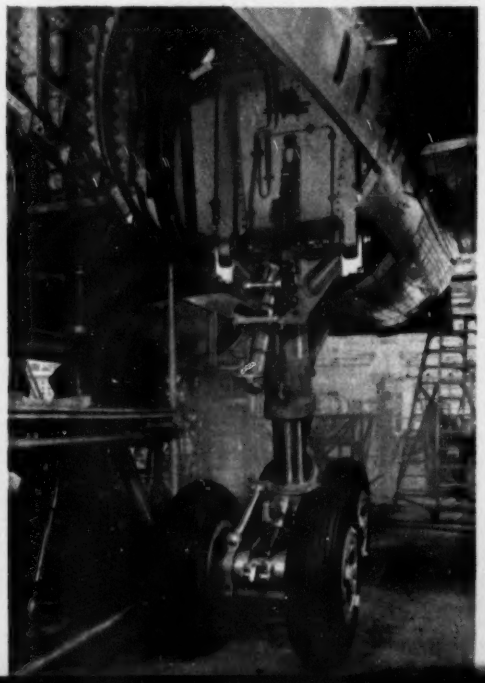
Wings and Nacelles : Wing structure with all access doors; all flaps (port only) with controls; aileron controls (partial); inner nacelle, p and s; outer nacelle (port only); undercarriage, p and s; undercarriage doors and operating mechanism; fuel tanks (port complete, starboard Nos. 1, 2 and 3 bags only); fuel system (port complete, starboard collector tank and cross-feed only); dummy power-plant (port inner); exhaust system; leading-edge de-icing with all ducting; air-conditioning system (port complete); accessory gearboxes (port inner and outer, starboard inner); hydraulic system, including pumps; electrical system with alternators on inner nacelles only; engine controls in wings (partial).

Fuselage : Fuselage structure with doorways, windows and escape hatches (including pilots'); control pedestal, coupled up; main flying controls, with partial control runs; trimmer controls; control surface locking (on jury rig); autopilot controls (partial); engine controls; airscrew controls; undercarriage controls (including parking brake); nose undercarriage; nosewheel doors and operating mechanism; nose fairing; hydraulic system (including u/c braking system); electrical system; nose scanner, all aerials and radar mounting; oxygen system; fire-suppression system; pilots' seats; dashboard and instrumentation (together with complete instrument panels at sides and in roof); windscreen and d.v. windows; windscreen de-icers; windscreen wipers; rest chair; crew door; luggage door; navigator's station with seat; radio officer's station with seat; sextant station; flight deck rear bulkhead; emergency hatch in floor; air-conditioning controls (complete), ducts (partial); sound-proofing and trim cloth (flight deck only); instruments and roof lights (flight deck only); blackout curtains.

In planning the schedules of tests for the equipment installations, the aim has been to foster experience not only

These views of the starboard undercarriage not only illustrate what a beautiful piece of engineering it is, but also show the method of anchorage to the spar, the unusual reversal of jack motion, and the transfer linkage for compensation of brake load between fore and aft pairs of wheels.





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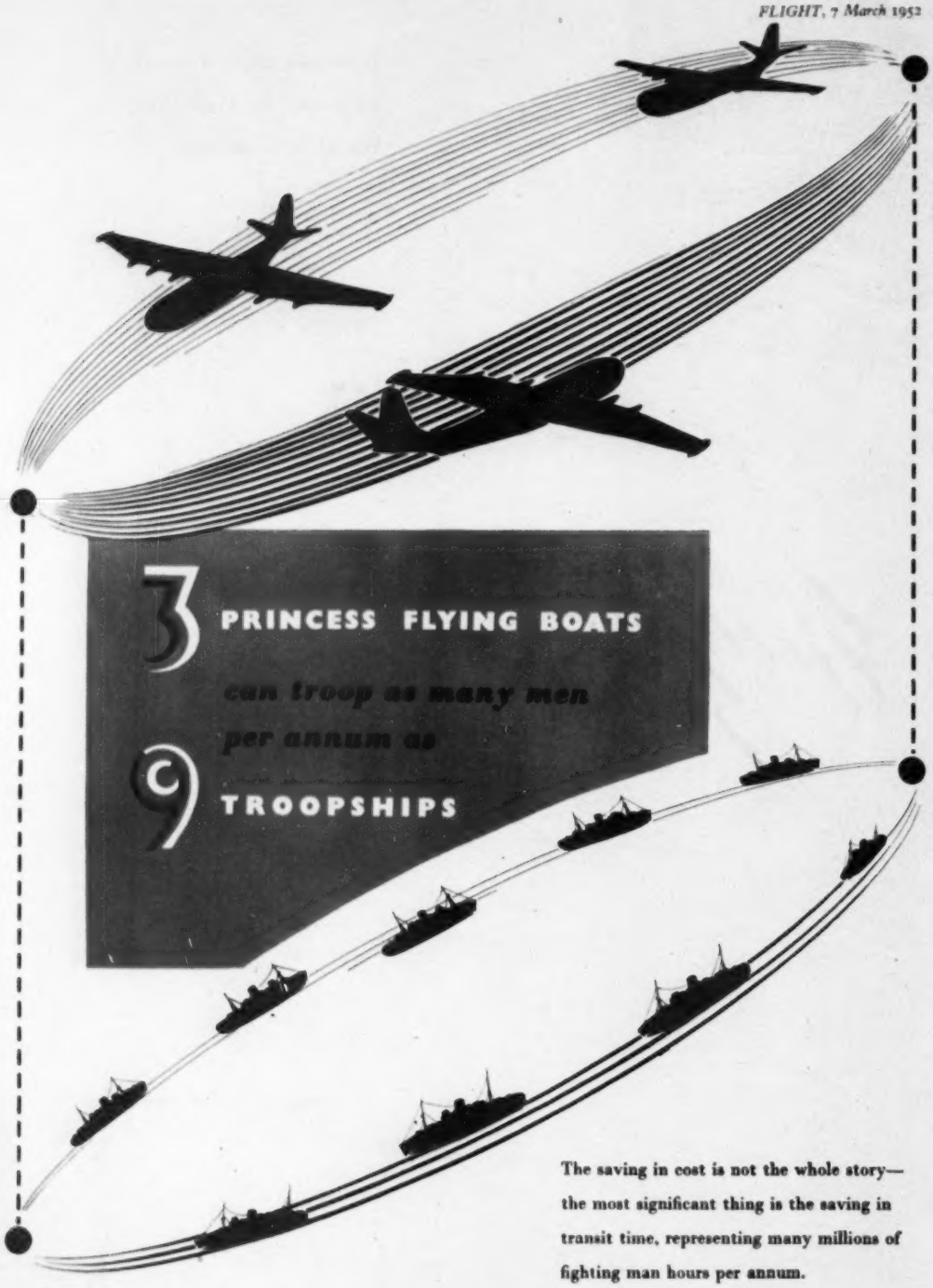

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NON-FLYING PROTOTYPE . . .

of the normal functioning, but also of the effects of deliberately introduced faults and mishandling. Thus, before the first Britannia taxies out for her maiden flight, a whole fund of working experience will already have been gained. Some indication of the scope of that experience is given by a précis of a few of the tests which have already been, or are to be, carried out on the non-flying prototype.

Starting with the fuel system, the tests have been made to establish the rate of flow and bowser feed pressure; the fuel distribution and effective capacity of the tanks when the shut-off valves close; the correct functioning of the re-fuelling valves; the leakage rate past the shut-off valves; and the rates of off-loading with and without pumps in operation. In addition, check tests have been made of the safeguards against pressurizing the engine feed lines during refuelling. Venting tests have included the checking of vent capacity at maximum rate of flow; and emergency venting to prevent over-pressurization under any normal flight condition. The N.F.P. has been slung in various representative sustained flight attitudes (see heading picture) and whilst in these attitudes, tests have been carried out to check the flow between interconnected tanks, the functioning of the jettison system, and also the normal supply of fuel to any one engine from any one tank. Faults such as failure of collector box pumps, the isolation of tanks in one wing, and feed interruption have deliberately been introduced in order to gauge their effects.

The tests of the control systems are naturally exhaustive, and embrace the engine controls and the primary and secondary flight controls. The engine control system is such that a governed rate of throttle opening obtains irrespective of the rate of movement of the throttle lever. For functional testing on the N.F.P., an electric actuator is used to drive a position indicator, so enabling the positional control side of the system to be checked. Any one of the three over-heat switches (normally situated in each jet pipe) can be artificially heated to check that the throttles close automatically, this being indicated by the position transmitter. By deliberately producing an open circuit as a fault in the Wheatstone Bridge circuit, the suspension of operation of the positional control can be observed. The throttles are interconnected with the control surface locks in a manner such that, when the latter are closed, only a limited range of engine r.p.m. can be selected, and, therefore, take-off cannot be initiated.

Flight Controls

The primary flight controls of the Britannia are connected to full-span servo-tabs which react aerodynamically on the main surfaces. As a consequence, the hinge moments felt by the pilot are negligible, and it is thus necessary to provide artificial "feel" which will give positive self-centring and will increase both with displacement and flight speed. The N.F.P. control test schedule calls for deflections of each complete circuit and of intermediate sections to be made with varying loads up to "pilot's minimum effort" in order that total deflection may be split-up and apportioned to the various components of the circuit. Backlash is obtained by projecting the mean slopes of the loading and unloading curves back to the deflection axis, the distance between intercepts providing the amount of backlash. Static friction is determined in terms of stick or pedal force for the complete circuit, and consideration is given to the measurement of inertia forces obtaining at various rates of operation of each circuit.

Calibration tests on the artificial feel system are carried out over an appropriate range of tab movement with the feel system adjusted to correspond with the mechanical advantage appropriate to any given flight speed. Following these initial calibrations, the pitot and actuator system will be incorporated for further calibration of pressures and actuator movement, together with re-calibration of variation of stick and pedal forces with variable dynamic pressures corresponding to flight speed.

Flap control test loads are applied by means of jacks arranged to simulate loading of screw jacks and carriages under 2/3 proof aerodynamic loads, i.e. under maximum operating requirements, or 50 per cent in excess of average conditions. Air loading on flap and slat is simulated by means of a series of hydraulic jacks pinned to bridge pieces attached to the flap, spacing being so arranged as to duplicate the spanwise distribution of loading, and provide the designed hinge moment about the centre of rotation of the flaps. It has been arranged for conditions in the maximum loading case (corresponding to 50 deg flap deflection) to be fully representative not only of hinge moments, but also of actual shears. Maximum system torque is therefore closely approximate to the designed conditions.

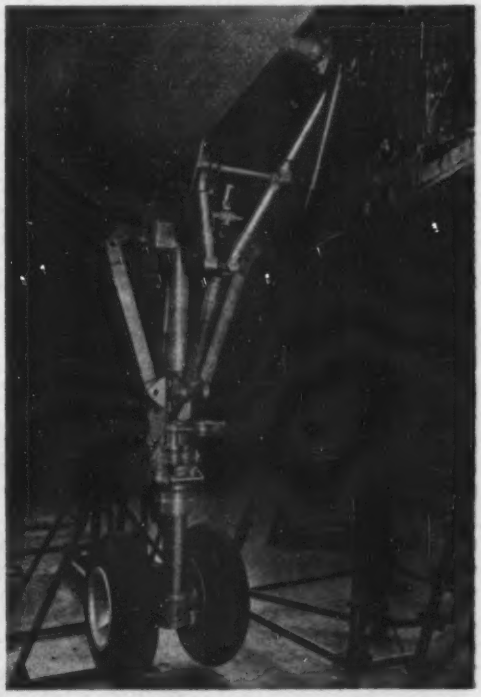
Under test, measured torques are obtained under running conditions in order to simulate dynamic friction effects. Functioning tests include emergency operation on one motor only, together with checks on shaft deflections. The emergency control is checked by moving the selector switch to the "emergency" position, and inching the flaps to the fully "up" or "down" positions to check the operation of the limit switches on the flap tracks.

As part of the series of tests of the hydraulic system, the main and nose undercarriages are actuated at the appropriate most adverse loads for raising at "take-off" engine r.p.m., and lowering at "cruising" r.p.m. These tests call for 25 operational cycles and, in addition the undercarriages will be actuated for an endurance run of 1,000 cycles to check the operation of cut-out valves, warning lights, pressure gauges, control valves and switches, and to gauge the wear on rubber rings and seals in the jacks, accumulators and swivel joints. During the course of these tests, the undercarriages are lowered by means of the alternative electric-pump and hand-pump emergency systems. At each lowering, the hydraulically operated wheel brakes are applied to check the hydraulic circuit and mechanism. The hydraulic circuit is fully instrumented on automatic observers, and quantities such as oil flows, pressures, temperatures, bogie and oleo positions are recorded on ciné-film for final plotting.

At the conclusion of these tests, the hydraulic system is drained and re-filled with an alternative fluid of different temperature/viscosity characteristics, and the 25-cycle worst-load tests on main and nose undercarriages repeated.

These condensed examples of but a few of the functional tests executed with the non-flying prototype serve to indicate just one aspect of the manifold advantages to be derived from having, as it were, a preparatory stand-in for the aircraft proper. It would, however, be unwise for too much emphasis to be placed on the "preparatory" nature of the concept. The non-flying prototype is foreseen as having a useful life probably of the same span as that of the Britannias in all the marks and variants in which they will doubtless be produced. Modifications, trial installations, new suggestions, and revised ideas, all will be assessed on the N.F.P. before incorporation in production machines; by this means, the manufacturers will in effect have a Britannia to play with which, unlike other prototypes, cannot be flown away for experimental trials at official establishments. That the whole idea is a success may be taken as beyond question, and there can be little doubt that this innovation by the Bristol Aeroplane Company will prove to be the precursor of a method which, in the not too distant future, will become standard practice.

One of the jobs carried out on the N.F.P. is undercarriage functional testing—by which, for example, the difficult geometry of the nosewheel fairing door actuation linkages can be accurately checked.



The staff of A. V. Roe's Clifton Street works in the Spring of 1915. Those in white overalls are mostly trade apprentices, and in the centre of the middle window is seen Ted Foulkes, the foreman pattern-maker. On the extreme right, his hat at a jaunty angle, is Albert Platt. The lady in the front row is believed to be Miss Walker, and on her left are H. V. Roe, A. V. Roe and, two further along, H. E. Broadsmith, while on her right are seen Roy Chadwick and R. Parrott, the works manager. In front and to the left of Mr. Foulkes are Messrs. Gaunt, Clifton, Holmes and Scott.

PRE-1915 APPRENTICES DINE

A Remarkable Avro Function: Recollections of Pioneer Days

REUNIONS are usually happy occasions the world over. Last week, on February 26th, a rather special affair of this kind was held at the Café Royal in London, when the earliest apprentices of A. V. Roe and Co., Ltd., Manchester, met together for the first time since 1915. A few had kept in touch and even arranged meetings, but the majority had not. Hardly any one of these pioneers is still connected with Avro or even with the aircraft industry, but as Sir Roy Dobson said, they had handed on their skill, teaching others to carry the job on. They had started Avro and the breed went right through.

The moving spirit behind the reunion idea had been Mr. J. C. C. Taylor, who for many years has been with Shell-Mex and B.P. His idea was received enthusiastically, and Avro, through Mr. Wood and others, took over their share of the organization. During the evening each of the pioneer apprentices received a handsome pair of initialled gold cuff-links from his old company. Speeches—everyone made one—were informal and reminiscent, although both Sir Roy Dobson and Mr. Taylor had a few more serious points to make. Received with particular enthusiasm was a proposal that a trophy should be provided by subscription as a prize for present-day apprentices.

The "two-minute" speeches of each apprentice provided a rich store of personal recollections, many of which ought to be preserved in a history of the company and its employees. Several confessed that their memories of the early days were more vivid as well as more pleasurable than those of between-war events.

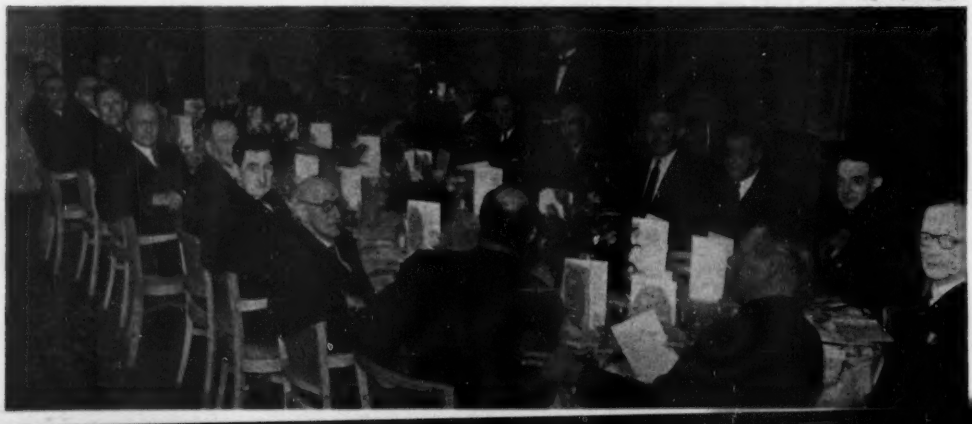
Mr. J. C. C. Taylor, given the job of proposing "the firm," observed that although some of the party had not met for over 30 years, they had all been founders together; few, however, were in aviation today. After a word on Avro personalities and products today, Mr. Taylor recalled some ancient history which personally concerned most of the guests present. He referred to Fred Holmes, the "gentleman apprentice," who used to be given the job of entertaining important visitors at Hamble; A. Cdre. Smylie, who was remembered for his F. N. motor-bike and the old mackintosh that went with it; Bill Gower and his Calshot and Circuit of Britain Race associations; A. Cdre. John Oliver, who had left to join the R.F.C. and was still flying and racing today; Albert Platt, who ran amok in Mather's works in a 504; and to Henry Goodyear's association with the first raid on Friedrichshafen.

Sir Roy Dobson, replying for the firm, first read messages from apprentices who could not attend, and from friends and associates of the company. Among them were Mr. Clifford Kent, operations manager for B.O.A.C. in Montreal and Mr. H. E. Broadsmith from Australia who, proposed to drink a toast to the company at the time of the dinner, even though it meant getting up at 6 a.m.

After reviewing "the old firm's" war-time production record, Sir Roy referred to the Avro Canada company which was thriving, as were the many new industries dependent upon it.

Clockwise around the reunion table are seen Sir Alliott Verdon-Roe, Sir Roy Dobson (in front of the waiter), and Messrs. Holmes, Smylie, Norwood, Morris, Prince, Gower, Oliver, Thurston James, Platt, Rylance, Partridge, Fozard, Mather, Shires, Goodyear, Maurice Smith, Horrax, Shipperbottom, Ratcliffe, McKenna, Taylor and Clifton.

"Flight" photograph



In groups (1) and (2), left to right, are seen E. Mather, F. Rylance and A. E. Platt; and E. Shires, J. W. Ratcliffe, H. E. Fozard and F. McKenna.

"Flight" photographs

In photograph (3) above are A. R. Partridge, A. Cdre. J. Oliver, and C. Horrax; left (4), Sir Alliott Verdon-Roe and Sir Roy Dobson; and right (5), H. H. Goodyear, J. C. C. Taylor and, in the background, F. G. Clifton.

Turning to the earliest days, Sir Roy said that it did not matter what individual was first. The few pioneers were all there together, risking everything they had, in particular their lives and money, and as a result we had the industry today.

In times of peace it was perhaps wise to be a nation of prototype builders (as he had heard us called in America). The main thing was to have good designs ready for building in time of need; such a time had now arrived, said Sir Roy.

Sir Alliott Verdon-Roe, proposing "absent friends," added more reminiscences about his early associates. But for his brother, H. V. Roe, he himself would have been absorbed by one or other of the motor companies.

Starting with Fred Clifton (now with the M.C.A. Accident Investigation Branch), each guest then went on to recall incidents of the past, and on several occasions controversial matters developed into amusing discussions.

Harry Goodyear, who recently retired from Blackburns, told the story of the preparations for the remarkable 504 raid on the Zeppelin hangars at Friedrichshafen. The first flight the machines made was that of the raid itself, the engines were second-hand and each machine carried four 20-lb bombs.

It may be added here that almost everybody at dinner seemed to have been associated in one way or another with the design, construction and attachment of the bomb racks used on the 504s.

Fred Holmes thanked those present for all they had taught him, particularly Albert Platt. They had taught him to use his hands, and not to be dependent upon machines, and the knowledge and experience had been useful to him all his life.

Mr. Frank McKenna, until recently a director of Glosters, gave a broad history of his experiences since 1914, and it was he who first referred to the flight of the Avro Pike with two Sunbeam engines. It proved to be extremely tail-heavy in the air, and Sir Roy Dobson, who was in the back cockpit, climbed over Raynham, the pilot, and sat just behind the engine for a landing to be made.

C. "Clifford" Horrax said that it was not always appreciated what a great part "A.V." himself had played in the background development of A. V. Roe, including work on the Avro car. He himself had been associated with this work and with aircrews. "A.V." had been one of the first to appreciate true streamlining. He remembered the Hamble days, when he and Sam Pemberton (now in Canada) used to ride a Harley Davidson to work, and often found themselves just behind A. V. Roe on a Royal Ruby and wearing cowboy chaps cut from aeroplane fabric. On his slower bike, "A.V." on occasions flattened himself on the tank in an endeavour to leave the big Harley Davidson behind. In any case, Mr. Horrax said, he and Pemberton dare not pass the boss.

Ernest Mather said that among treasured possessions he still had two bolts from the original bomb gear of the Friedrichshafen 504s.

Mr. P. Morris, who was one who claimed to have stuck to his job since 1915, talked of the first all-metal fuselage. A. Cdre. Oliver (who originally left Avros to join the R.F.C. and is, of course, with Goodyear today) read a message from a lady of over 80 years, sending best wishes to the early men of Avros, many of whom she remembered with affection—it was from his mother. A. Cdre. Oliver claimed his part in the work on the bomb racks.

A. R. "Claude" Partridge, now postmaster at Colchester, said he regretted in many ways that he had ever left the company.

Albert Platt, one of the earliest employees (at 2d. per hour under his pattern maker's rate), spoke of the very difficult financial time the company had in the early days. On occasions, the men were kept working overtime on Saturday afternoon to give the management a little more time to find the money for their wages. He remembered two machines being sent to the Blackpool meeting by rail. They had not been insured; a spark from the locomotive set both on fire, and they became a total loss. Even so, it was possible in a few days to complete another airframe, and at the last minute an engine was obtained also.

Bob Shipperbottom, who is still in the drawing office, said he was one of the juniors of the old days, and had at the time of the Friedrichshafen raid been employed on filing welding off struts.

A. Cdre. Smylie said he had left in 1914 to become a user. He remembered Dobbie (Sir Roy) joining the firm (as did others present) and his ideas for woodworking machinery. He had previously been employed on shaping coffin lids for a firm in Rochdale, and had been christened "Coffin-lid Dobson." He had ideas of applying mass production to the Avro job even then.

Bill Gower said he was still with Avros and it was a pleasure; and, following a contribution by Fred Rylance, E. Shires (who for a time joined the Hawker company but is now plant manager at Glaxo) recalled many of the pioneers, among them, Frank Vernon the mathematician, whom he believed was in Vancouver.

Last on the list was Hugh Norwood, now with Ransome and Rapier, who believed that with Clifford Horrax he had been the first man to meet Sir Roy Dobson when he came to apply for a job. They did their best to put him off, but without result. His claim in connection with the bomb racks was to have made the original drawings. A. V. Roe had told him that they were a Heath Robinson job.

THE INDUSTRY

H. M. Hobson Results

AT the sixteenth annual general meeting of H. M. Hobson, Ltd., held recently in London, Mr. S. W. Hughes (chairman) told shareholders that he was happy to report that once again the firm was fully engaged for some time ahead, not only on an expanded programme of its own products but also on the manufacture of similar items for many of the leading aircraft and engine manufacturers. There were many Government contracts, some of considerable importance. Research, design and development work had continued unabated and it was hoped that some important new projects would bear fruit in future years. Integral, Ltd., the subsidiary company, continued to make good progress and had paid an increased dividend. It, too, would have the benefit of increased factory area in the near future.

Profit of the two companies amounted to £156,423 before taxation, as compared with £147,376 for the previous year.

Normalair Progress

RAPID developments in the work of Normalair, Ltd.—particularly in the fields of civil and military cabin-pressurizing, and of high-altitude breathing equipment—have necessitated extension of the firm's research and production facilities.

A further rearrangement and expansion of the high-altitude research laboratory at the Yeovil works has been completed, the engineering staff at the works has been increased, and an engineering section has been established in London. In both cases many additional machine-tools and other production equipment have been installed, and further floor-space is already being prepared.

A subsidiary company is being formed in Australia to service Normalair equipment in that area, and servicing arrangements are also being made in Canada, France and elsewhere.

The issued capital of the company has recently been increased to £100,000 and the authorized capital to £250,000. It is stated that substantial finance has been made available to the company for development at once upon the scale required.

Normalair, Ltd., is a wholly owned subsidiary of Westland Aircraft, Ltd., whose two major shareholders are John Brown and Co., Ltd., and the Associated Electrical Industries, Ltd.

New H.D.A. Foundry

ON Wednesday, February 27th, the new pressure die-casting foundry at High Duty Alloys, Ltd., Slough, was officially opened. The design-planning of the foundry had been accorded a great deal of careful experiment with the result that the company feel justified in claiming it to be the most up-to-date unit of its kind in the world.

With 7,600 sq ft of floor area and a clear 20ft height from floor to roof truss, high-level lighting over the whole area, wide entrance and exit doors, and the carefully-considered siting of plant, the foundry bears little relation to the "glooming caverns" normally associated with the term. The company have so blended old and new plant and machines as to provide a complete production range at the most economic figure. At the same time, the size range of pressure die-castings has been increased with the result that it is now possible to produce castings in weights ranging from 1 oz to 30 lb.

Rigid precautions are taken to ensure control of the specification of the alloys used: material reaches the bulk foundry in ingot form after analysis by the laboratory and, after melting, is submitted once more to mechanical and analytical tests. It is then carried by overhead cranes to the individual gas-fired furnaces.

Part of the new High Duty Alloys foundry referred to above.

THREE HEADS bent in earnest conversation at the recent opening—reported in these pages last week—of the new Hellerman Electric premises at Crowley, Sussex. Left to right: Mr. H. R. Whyte, A.M.I.E.E., Hellerman's works manager; Mr. W. Puckey, Deputy Controller of Supplies (Aircraft Production), M.o.S.; and Mr. W. R. McGaw, Director of Aircraft Production (G), M.o.S.

Combined Experience

FOLLOWING our announcement, last week, of the important new licence agreement between the de Havilland Engine Co., Ltd., and the General Electric Co. of America, a brief historical-background note on the gas-turbine work of each company will be of interest.

The General Electric Company's experience with the gas turbine goes back to September, 1941, when the U.S. Air Force asked them to undertake the re-design, further development and production of a jet engine based upon plans of the Whittle unit. The engine, designated I-A, first ran on March 18th, 1942, after which there were additional models of the "I" series.

Early in 1943 two entirely new designs were undertaken: the 11-stage axial-flow J-35 and the centrifugal "straight-through" J-33. Both were rated at approximately 4,000 lb thrust.

In March, 1946, work commenced on the J-47, which is currently one of the main production engines of the U.S. Air Force and which has a thrust rating in excess of 5,200 lb. The model powering the Boeing B.47 Stratojet bomber is rated in excess of 5,800 lb. The latest engine, the J-73, was announced in June, 1951. Although thrust was not disclosed, the unit is described as far more powerful than the company's present battle-tested jets. The company has disclosed also that it is working on other new engines, including the XJ-53, not further identified. An electronically controlled G-E engine equipped with afterburner and designated the J.47-GE-17 powers the F-86D intercepter.

General Electric also designed the first American turboprop, the TG-100. The first flight took place in December, 1945, in a Consolidated-Vultee XP-81.

In 1950 the company purchased the patents, name and technical data of the Turbodyne Corporation of Hawthorne, California, and instituted a test programme with Turbodyne engines. The Turbodyne XT-37 is claimed to be the most powerful propeller-type aircraft power plant in the world.

The background of the de Havilland Engine Company Ltd. is well known to *Flight* readers.

The company has been actively working on gas turbines since shortly after the Battle of Britain in 1940, and was the first established British engine builder to enter the field of the gas turbine with a power unit intended from the beginning for quantity production. The Goblin was the first aircraft gas turbine to secure official type approval in 1945, and development went ahead so successfully that within four years an overhaul life of 600 hr was officially sanctioned. De Havilland experience was made available to America as early as 1943, when examples of the H.1, prototype of the Goblin, were sent by air freight, and it was this engine which powered the Lockheed XP-80 Shooting Star fighter prototype on its first flights early in 1944.

The larger D.H. jet engine, the Ghost (rated at 5,000 lb static thrust), holder of the international height record of 59,446ft, has made possible the realization of a practical transport aircraft with jet propulsion, the de Havilland Comet. The Ghost is required in large numbers for the Venom and for other fighter applications, and it was recently decided to set up six entirely separate production organizations for its manufacture in strategically separated parts of Western Europe.

The success of the de Havilland centrifugal-compressor engine has not, it is stated, deterred the company from development of further designs, of which no details may as yet be disclosed.

The lead that Britain has gained in jet power for commercial airliners is one outcome of another British development, the Nimonic Series of Alloys.

Both on test and in service, these nickel-chromium alloys have established their ability to resist stress at the extreme temperatures at which the vital parts of a gas turbine operate. Every British aircraft gas turbine in production makes use of one or other of the Nimonic alloys for rotor blades.

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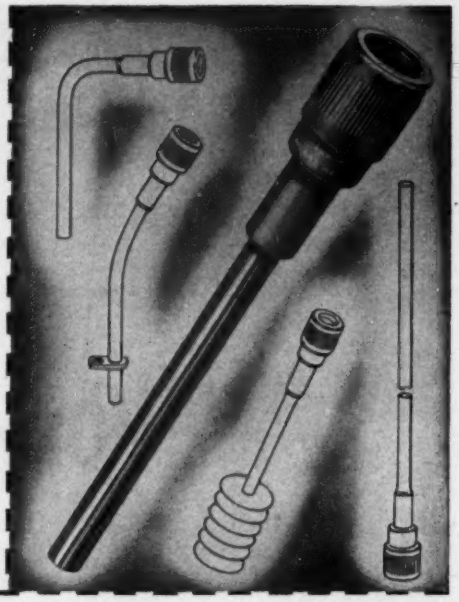

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STEEL STRIP

SHEETS AND SECTIONS
TO A.I.D. SPECIFICATIONS

HABERSHON

ROTHERHAM

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Naval Counter-attack

PERMIT me to take up the cudgels on behalf of Naval Aviation and comment upon three points in "Spinifex's" interesting if ill-informed letter published in your issue of February 1st.

Firstly, "Spinifex" is apparently unaware that what he is pleased to call the "ridiculous uniform" worn by sailors springs not only from tradition and sentiment but is so designed to retain its smartness when kept in the confined spaces of a ship's mess-decks without the aid of trouser-press and coat hanger. I would ask "Spinifex" how often he has seen (a) an "erk" wearing a creased and crumpled uniform with baggy trousers that looked as if it had been slept in, and (b) an untidy-looking sailor in an unpressed uniform?

I would further inform "Spinifex" that this "ridiculous uniform" of our sailors is worn with pride by the average rating, who has no desire to change to the "fore-and-aft" rig with its attendant collars and ties worn by Naval stewards and others as well as by the Army and Air Force.

Secondly, referring to "jobs for the boys": as a means of increasing the understanding between the airmen and the nautics in recent years, and for the last five years in particular, My Lords have always appointed non-air specialists to Naval Air Stations as executive officer and second-in-command, and have appointed qualified pilots and observers (on reaching commander's rank) to appointments afloat, either in command of a small ship or as executive officer and second-in-command of a large one. Truly, the marriage between sea and air has never been better integrated to the mutual benefit of all concerned.

My third and last point refers to the *Scharnhorst-Gneisenau* affair, regarding which I do not think "Spinifex's" remarks should go unchallenged. Without wishing to wash any dirty linen, was not the tragedy of this affair that an entire Swordfish squadron was annihilated through pressing on to the attack in outrageous weather conditions that had prevented their R.A.F. fighter escort from keeping its rendezvous to time?

Fife. P. F. T. S.

A Flying-boat Club?

THERE exists the Helicopter Society of Great Britain and also the Airship Club of Great Britain; why not a flying-boat club?

Such an institution would enable those of us who occupy the more humble posts in or on the fringe of the aircraft industry to give full moral and financial support to the stalwarts who, like Sir Frederick Bowhill, are "voices crying in the wilderness."

At the moment we flying-boat enthusiasts are regarded by the rest of the industry in much the same light as those "in steam" are wont to view the protagonists of the sailing ship. Surely nothing less than a properly constituted movement capable of carrying out serious research, and of putting forward the just claims of the flying-boat to a place in our civil and military aviation, will ever succeed in persuading potential users of "boats" that our faith in them is based on much more than romantic sentimentality.

Ilford, Essex. A. S. RICHARDSON.

The 1910 Coanda "Turbine"

DUE to a delay in the delivery of my copy of *Flight* for January 11th, the letter from your correspondent, Mr. J. Billings of Birmingham, has only recently come to my attention.

I was most interested to read of his inquiry with regard to the Coanda biplane exhibited at the 1910 Paris Show, as quite recently, only in a different way, my attention was drawn to this fascinating aeroplane. Endeavours which I was making to obtain information concerning it brought to light a British Patent (No. 12,740) the Complete Specification of which was accepted on January 18th, 1912. This patent refers to "Improvements in or relating to Propellers" and does in fact concern the form of propulsion employed for the aeroplane concerned.

As noted by Mr. Billings, Coanda employed a conventional reciprocating engine to drive the "propeller"—as it was termed in the specification.

The patent is lengthy and somewhat involved; a summary may, however, prove of interest. The water-cooled reciprocating engine drove the "propeller" directly or through spur gearing. Air, taken in through radially arranged guide-vanes, was passed through conduits which caused it to turn and flow in a direction perpendicular to the axis of rotation of the propeller. The air then passed into the blades of the "propeller" which discharged it through a diffuser comprising a number of orifices at the rear of the "cowling" in the same direction as that of the initial intake-air flow. The system was similar to that of Campini but, whereas Campini added a combustible medium to the compressed fluid and ignited the mixture in a combustion chamber, Coanda utilized the reciprocating engine exhaust gases by conducting them from a semi-spherical collection chamber, forming the inner wall of the air intake, and then through hollow radial extensions located between the incoming air conduits which directed them through the blades of the "propeller."

The Coanda biplane, with its strangely modern cowling.

The worked cooling water from the reciprocating engine was circulated through a jacket enclosing the exhaust gas collector in order to prevent an excessive fall in the temperature of the exhaust gases prior to their utilization. Here, Coanda produced a device, incorporating an inter-cooler, the principle of which was remarkably similar to that of the modern exhaust-driven turbo-supercharger. He drew attention to the fact that, at the same time, the hot exhaust gases would raise the temperature of the working medium. This temperature-rise was in fact a secondary heating, as the air had already been preheated prior to coming into contact with the exhaust gases. The initial temperature-rise took place when the incoming air passed through the conduits. The "heat-exchanger" at this point took the form of jackets surrounding the intake-air conduits, the worked cooling medium of the reciprocating engine being conducted to the conduit jackets from the exhaust gas collection chamber jacket mentioned previously. Coanda pointed out that this transfer of heat from the worked cooling medium would dispense with the necessity of a radiator system.

He stated finally that a depression, created by the turbine effect, would expedite the escape of the air from the orifices of the discharge diffuser. At the same time, the partial vacuum built-up by the escaping air would tend to draw the exhaust gases into the "propeller" blades, thereby eliminating back pressure in the engine and tending to assist the exhaust gases out of the engine and into the blades of the "propeller." As will be appreciated, Coanda was a man who did not believe in waste of any kind!

To consider his proposals seriously however, it is fully evident that he had many excellent and sound ideas, some of which only came to be assessed at their true value in practice many years later. He only just missed inventing the aircraft gas-turbine by not thinking to inject a fuel into the discharge airflow from his "propeller" and burning the mixture in a combustion chamber prior to its ejection.

A reasonably concise description of his invention and the mode of operation is not easy to construct. An attempt might, however, produce something on the lines of the following: "A compressor-impeller arrangement for aircraft reaction-propulsion, driven primarily by a water-cooled reciprocating engine and secondarily on the turbine principle by means of the exhaust gases of the driving reciprocating engine; which compressor-impeller incorporates a plurality of heat-exchanger systems utilizing the worked cooling medium of said reciprocating engine in heat-exchange relationship with the air and exhaust gases prior to their entry into the compressor-impeller."

Great Bookham, Surrey. JOHN W. LANE.

Heraldry and Aerodynamics

READING a French aeronautical magazine the other day, I happened to notice a photograph of a line-up of French-built Dassault M.D. 450 Ouragan fighters. All these aircraft and, for that matter, all modern French military aircraft, carry their tricolor stripes on the *rudder*, and not on the tail fin, as in Britain. Surely, somewhere in the 1930s, our Air Ministry decided that such additional paintwork on a control surface was liable to lead to disaster and, as a result, tail stripes were removed altogether,

CORRESPONDENCE . . .

to be replaced during the war, when they again became necessary, on the fin. Yet, as I say, modern French high-speed aircraft still stick to their rudder markings, with no apparent ill-effect, even though the majority of countries have slavishly copied Britain in transferring these markings to the fin.

Pecklelon, Leicester. DONALD A. S. MCKAY.

[We believe that the original aerodynamic considerations arose largely in the case of fabric-covered rudders. Metal surfaces, and efficient modern finishes, cause no such problem; presumably, however, the R.A.F. does not consider necessary a return to the old marking.—ED.]

Losing the Peace

MOST of your readers are aware that we lost the peace even before we won the war, if only from recent reviews (on the radio and in the national Press) of Mr. Chester Wilmot's *Struggle for Europe*. The Russian gain was not, however, only of territory, mineral and industrial resources and subject (or "liberated") peoples. Had the Western Allies captured Berlin, Prague and Vienna, perhaps the greatest prize would have been denied the Russians—the ideas, men and equipment that have enabled them to make the great technical advances mentioned in General Vandenberg's statement ("Vandenberg Speaks His Mind," page 152, *Flight*, February 8th, 1952); again greater than the knowledge of the atomic bomb ("For good or ill, air mastery is today the supreme expression of military power"—Mr. W. S. Churchill).

These advances would not have been made had not the Russians made the best and most intelligent use of all they found.

"It is easy to be wise after the event," but at the time (of the German collapse) I felt that the Western Powers did not make full use of their opportunities, and that the German design teams should have been allowed, indeed encouraged, to carry on their work unhindered. Strong security and liaison staffs could have been sent to watch them and to report their progress to Farnborough and Boscombe, where prototypes could have been sent for test flying; instead of which the design teams were split, and divorced from their equipment.

We captured the best German designers. Kurt Tank, starting afresh in Argentina, where research and production facilities cannot be all he could wish, has produced the excellent Pulqui II. Willi Messerschmitt seems largely to have vegetated (though I believe he made some houses and furniture) and must now gather the threads again in Spain. Dr. Lippisch is somewhere in the U.S.

What might these men have done in the past seven years with proper finance and facilities?

Our aircraft industries received a great shock in 1945, and a great benefit, but as a lump sum; had we invested the men as well as their machines we should be still receiving a steady flow of ideas and information.

Cambridge. PEDANTICA.

Armouring the Crew

RECENT Press reports of the testing by troops in Korea of a new nylon fabric and sponge rubber bullet-proof jacket indicate that the modern practice of providing no personal armour at all for men in battle, save for the tin hat, may soon be a thing of the past; it has been as absurd as the mediæval practice of so encasing men in armour that they eventually became an almost helpless target for more lightly armoured opponents and so caused a reaction to the opposite extreme.

It is to be hoped that the appropriate authorities whose task it is to conserve the life and limb of our fighting men, so that their limited numbers and equipment can be used to best advantage, will not forget the advantages of applying this principle in the air as well as on the ground. In the last war it was fashionable to deride the foresight of the Americans for protecting their bomber aircrews by flak suits, and for the heavy armouring of the Flying Fortress aircraft in which they made their hazardous bombing missions in daylight over the shell-torn skies of Europe; but, if they tended to err on the side of over-doing such protection, so, too, did we err in the complete neglect of any protection for the aircrews who manned our much-more-lightly-armed night bombers, into whose defenceless bellies the enemy's night fighters poured their fire almost with impunity.

Today we appear to be relying on speed alone for the protection of our bomber aircrews, just as in the last war we relied on darkness alone, to our cost; yet speed is only relative, and with fast fighters and self-seeking missiles keeping pace with, if not exceeding, high-speed bomber development, the problem of defence is much the same; at altitude, too, high speed makes little difference to high-ranging modern anti-aircraft guns firing with all the precision afforded by present-day, radar-controlled predictors.

It would be a mistake, in my opinion, therefore, to be led to conclude that the relative immunity enjoyed by our Mosquito bombers and P.R. aircraft flying high and by night in the last war would apply in exactly the same way in any modern air war today, and from this conclusion decide that no protection, either in the form of armament or armour, would be necessary.

There is another field in which, too, we might profit by the example set by the Americans, and that is in the protection given pilots against the skull injury likely during a crash or forced landing. American pilots are provided with flying helmets which incorporate rigid crash-helmet protection, and how necessary this is to Service pilots can be easily appreciated by anyone who cares to study the high proportion of flying accidents in which death is caused by a fractured skull or other head injuries.

East Twickenham, Middlesex. DENIS HORNSEY.

Old-Timers' Corner

SORRY, but I cannot let Mr. C. G. Grey (Correspondence, February 22nd) say that Harry Busteed obtained his ticket at Sopwith's School of Flying. No sir! Harry Busteed got it at the British and Colonial Aeroplane Company's School at Larkhill—and I was there, Mr. Grey! Major Juillerot was chief instructor and Mr. Collins Pixey "second."

I remember very well that we saw other pupils waiting to do their "figure eights" and we, the staff, couldn't get Mr. Busteed down. He kept flying around; the evening was calm and now getting dark.

Mr. Eric Harrison was also a partner and friend of his; he obtained his ticket later. Busteed's ticket date was June 13th, 1911 (No. 94); Harrison's was September 12th, 1911 (No. 131)—per Royal Aero Club book. I also remember seeing Mr. C. C. Turner, late *Daily Telegraph* air correspondent, get his ticket a bit earlier than Mr. Busteed, in April, 1911. By the way, another name mentioned in Mr. Grey's letter should have been printed Bentley Dacre, and not Daere.

Several of those who worked on the Burney Boat mentioned are well and hearty and still work on other projects for the same company.

Brentry, Bristol. HAROLD SOLOMON.

IN BRIEF

IN a letter from Mr. C. Powell of the Decca Company, published last week, a printer's error caused the word "deployment" to appear as "development." The sentence should have read: "What is really surprising, however, is Mr. Gregson's assertion that the main factor delaying the introduction of V.O.R./D.M.E. is the international controversy now raging—implying, presumably, that from the technical and operational standpoints the combination of V.O.R. and D.M.E. is ready for deployment."

THE Chief Librarian, City of Johannesburg Public Library, Market Square, Johannesburg, is anxious to obtain a number of issues of *Flight*, now out of print, which are missing from his files. He wonders if any readers could assist by giving or selling copies: postage would be refunded, but he asks that any price should be quoted in advance. Dates wanted are: 1940—January 25th, March 14th, March 28th, April 4th, April 18th, May 2nd, May 9th, May 16th, June 27th; 1944—January 13th, January 27th, February 3rd, February 10th, February 17th, March 23rd, April 27th; 1945—October 18th, October 25th, December 6th, December 20th, December 27th; 1946—January 3rd, January 10th.

FORTHCOMING EVENTS

Mar. 8. British Gliding Association: Annual General Meeting.
Mar. 11. R.Ae.S. Graduates' and Students' Lecture: "An Introduction to Supersonics," by C. H. E. Warren, M.A., A.F.R.Ae.S.
Mar. 12. R.Ae.S.: Fifth Louis Blériot Lecture: "The Future of the Flying-boat," by H. Knowler, A.M.I.C.E., F.R.Ae.S. (in Paris).
Mar. 13. R.Ae.C.: Film Show.
Mar. 19. Aircraft Recognition Society: "Future Developments in Civil Aviation," by Peter G. Masefield, M.A., F.R.Ae.S.
Mar. 21. Helicopter Association: "Recent Helicopter Research Investigations," by W. Stewart, B.Sc.
Mar. 25. R.Ae.S. Graduates' and Students' Section: Annual General Meeting and Talk on "Aerodynamic Oscillations of Suspension Bridges," by C. Scruttton, B.Sc., A.F.R.Ae.S.
Mar. 26. R.Ae.C.: Annual General Meeting.
Mar. 27. R.Ae.S. Section Lecture: "Civil Jet Aircraft Performance," by D. R. Newman, A.F.R.Ae.S.
Apr. 4. College of Aeronautics: Senior Common Room Society's Annual Dinner.
Apr. 6. London Aeroplane Club: Dawn Patrol and A.G.M.
Apr. 15. R.Ae.C.: Film Show.
Apr. 22. R.Ae.S. Graduates' and Students' Section: "Servo-mechanisms," by F. H. Borlsce, B.Sc.(Eng.), Grad. R.Ae.S.
Apr. 24. R.Ae.S.: "Fuel Systems for Turbine-driven Aircraft," by J. E. Walker, A.F.R.Ae.S. (at Luton).
May 3. Vintage Aeroplane Club: Rally, White Waltham.
May 3-10. F.A.I.: Committee Meetings, Madrid.
May 10. Exeter Aero Club: Display
May 10-11. l'Association des Amis de l'Aumônories de l'Air: Cathedrals Rally.
May 17. Wolverhampton Aero Club: Display.
May 22. Aéro-Club du Dauphiné: Air Meeting, Grenoble.
May 22. Aéro-Club de France: Coupe Stamm (helicopters).

ROTOL

PROPELLERS

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Commercial Aviation Commentary

By HENRY MORRIS

ONE of the uncertainties which this new Government was expected to clear up was the future of "inclusive tour" operations conducted by people other than the Corporations. While the official policy has been to protect the Corporations from any form of competition, and always to give them the first choice of any potential traffic, the prospects of independent operators being granted permission to develop inclusive-tour traffic have been very bleak. The independents have always held that this is a class of business in which they could be given an almost completely free hand, for it could divert only a very little traffic from the Corporations' scheduled services; and even if there was some initial small diversion the general stimulus given to air travel would soon restore the balance.

It had been assumed that, whereas the Government could not be expected to produce very quickly a vast new plan for the air-transport industry as a whole, it could very quickly relax certain restrictions applied against independent operators in the past, and thus offer some concrete evidence of its intention to give the independents a better break. Allowing these operators into certain categories of operations would first involve changes in legislation; but the easing of restrictions against inclusive-tour work could be achieved without any such statutory changes, merely by the Minister giving a new directive both to the Air Transport Advisory Council and to the Corporations.

Certain operators have, therefore, been very shaken to have attractive inclusive tour proposals turned down flat, without explanation. The Government has changed; the policy, it seems, has not.

* * *

THIS is a very serious matter for the independent operators, who must now accept the continued closure of a market they had firmly expected to be opened. It may also be a serious matter for the travelling public. The independent operators can offer travel facilities at an economic rate which permits air travel at a cost per head very much lower than the rebated inclusive-tour fares by the scheduled operators. Travel agents wishing to promote a cheaper type of inclusive tour by the use of charter facilities could start breaking into a lower-income category of holiday maker. (This is why, basically, a more liberal attitude towards inclusive tours need not, and almost certainly would not, be purely diversionary in character.)

It is a great pity—and particularly because the reduced travel allowances restrict the holiday ranges of thousands—that new facilities of this nature cannot be offered.

Finally, of course, an even heavier blow has been struck—the passenger landing-tax, which all companies will try to pass on to their passengers. On the other hand, there are now indications that the short-haul operators may receive the benefit of reduced aircraft landing fees.

* * *

ON broader matters of policy, the air-transport industry is still anxiously waiting to hear what fate awaits it. Since the guarded and ambiguous statements by Lord Leathers in the House of Lords last December there have been no official indications from the Government as to how they intend to unite the State-owned and the private-enterprise sides of the industry into a state of marital bliss in which they will live happily side by side for ever after.

No doubt there are many official behind-the-scenes discussions and investigations and there are certainly signs of much lobbying by protagonists of all the different "vested interests." So far, however, no Pressman appears to have pierced the aura of secrecy which has descended.

In such an atmosphere of mystery it is natural that speculation, coupled with anxiety, should breed; and the longer a detailed statement of Government policy is withheld the more speculative becomes the guesses as to what the Government intends to do. One thing seems certain—that the Government went into power without any really cut-and-dried plans as to what to do with air transport.

Perhaps, however, the Government are finding it difficult to work out concrete ways and means of implementing the intentions expressed in the first flush of their access to power—including giving private enterprise a slice of the cake. It is understandable that they should hesitate to make any drastic changes without having a guarantee of success; also, they are taking care not to make themselves the target for criticisms indentical with those they often launched against the former Government—the introduction of new systems for purely dogmatic political reasons.

* * *

YET there are people in the air-transport industry—both servants of the Government Corporations and employees of private companies—who are prepared to say what they really think, and not what their masters tell them to think; and in their view the problem is not insurmountable.

Putting it simply, their attitude is that, with proper encouragement and leadership, the industry could be expanded in five to ten years to many times its present size. If plans were produced which would ensure a share of this future expanded industry for the State Air Corporations *and* the private-enterprise operators, then both sides could (or should) be happy. The Corporations could still look forward to steady expansion up to a size beyond which they would in any case become unwieldy and inefficient; and the private-enterprise side would have as much to get its teeth into as its financial resources are likely to seek.

Nor need the achievement of this split be such a frightening problem. Estimates of potential traffic during the next decade or so could be produced from information submitted by all sides of the industry. These estimates could be converted into aircraft numbers related to the types likely to be available within the next decade. The traffic potential could also be broken down broadly into different categories of traffic requiring different types of transport at different tariff levels. Once these initial assessments are made, the broad allocation of "spheres of operation" to different elements in the industry should not be difficult.

* * *

THE whole essence of such an operation must be to work on what the potential traffic really could be, given favourable conditions; it must not be related to existing traffic, existing ideas on tariff levels, existing aircraft fleets, or existing allocations of routes or monopolies.

This sounds all very simple and idealistic, but, of course, there is one big stumbling-block—the question as to what individual, or what body, is to be the authoritative visionary who will make the dream come true. One cannot expect the Minister and his Ministry—who, whether they like it or not, are by legislation saddled with the doubtful pleasure of looking after the State Air Corporations—to produce an impartial plan which would involve even a slight risk of dislocating or upsetting the Corporations in any way.

Always assuming, however, that the Government have the interests of the industry as a whole really at heart, and are not looking at the problem with any pre-determined decisions to project past policies into the future scheme of things, they should be able to achieve their object by handing the task over to some impartial body which can sit in judgment on all the thousand and one ideas that the contending interests are itching to put forward.

An independent air-transport authority, charged with the job of producing the maximum expansion of the industry, and of granting some form of operating licence to approved concerns (including the Corporations) who fit into the overall plan, would save the Minister many headaches and protect him from much political criticism.

CIVIL AVIATION

HELIPOST: This photograph, taken at Liege Heliport, shows one of the Sabena Bell 47D helicopters on the landing circle, while the company's other helicopter climbs away. Sabena has been operating a regular helicopter mail service over a circular route linking the more important Belgian centres since August, 1950.

CLEARING-HOUSE CELEBRATION

FRIENDS, patrons and well-wishers joined the manager—Mr. Arthur J. Quin-Harking, O.B.E.—and staff of the I.A.T.A. Clearing House in a London celebration on February 28th to mark its fifth year of operation.

Some idea of the great work accomplished by the Clearing House can be gained by the figures for 1951, when the turnover cleared amounted to £61 million, compared with £53 million in 1950 and £13 million in 1947, the inaugural year. Eighty-six per cent of the 1951 figure was settled by "offset" compared with 84 per cent in the previous year. This means that only £60,000 more money changed hands in 1951 to settle an additional turnover of £8 million. Another achievement is reflected in the fact that the Clearing House member-airlines received their settlements in an average of ten days after closure of the monthly clearance.

Three noteworthy examples of offset settlement during 1951 were: a North American carrier whose two-way clearance, totalling $1,272,463, was settled by $11,057, an offset of 98.3 per cent; a European carrier whose two-way clearance of £554,807 was settled by £1,711 (99.4 per cent); and an Australian member whose £19,047 two-way clearance was settled by £7 (99.9 per cent). In the absence of the Clearing House, the Australian carrier would have been involved in 24 settlements and collections totalling £10,000 in 17 currencies.

NEVER BIG ENOUGH

MR. PETER MASEFIELD, chief executive of B.E.A. has something to say about civil aircraft of the future. Writing in the February *Shell Aviation News*, he remarks: "Civil aviation's future prosperity depends essentially on the types of aircraft available to its exponents, whether they be major scheduled airlines, smaller charter companies, or the sadly-neglected private flyers. The unhappy fact is—and we must face it—that at no time since 1919, when civil flying really began, has the demand for civil aircraft of every type been worse served than it is today."

He goes on to say: "There are lessons to be learned from the work of the 1943 Brabazon Committee which has led to the new line of British transport aeroplanes of today. From the Brabazon Committee sprang the requirements which led to the design of the Ambassador, the Viscount, the Marathon, the Dove and, to a lesser extent, the Comet. Lord Brabazon's Committee performed a national service of the first importance. Like almost every prophet of the future in air transport, the Brabazon Committee which issued its first report in February, 1943, underestimated the requirements from the point of view of size, with the sole exception of the Brabazon I, built by Bristol, and even that started as a specification for an aeroplane capable of providing sleeping accommodation for only 25 passengers for non-stop services between London and New York.

"The Brabazon II, which was built by Airspeed to Specification E.27 43 as the Ambassador, was foreseen by the Brabazon Committee as: 'A 24-passenger twin-engine landplane for short and medium European stages and feeder services on the Empire route.' In the event, the Brabazon II, as B.E.A.'s *Elizabethan* class aeroplane, has been produced as a 47-passenger aeroplane and there is a clear demand for its further development to carry up to 70 passengers. Similarly the Brabazon IIB, built as the Vickers-Armstrongs V.630 Viscount, came forward as a 27-passenger aeroplane. But, by the time it goes into service as B.E.A.'s *Discovery* Class V.701 aeroplane the Brabazon IIB will have been stretched to carry 40 passengers—with a further tug ahead of it. The Comet has come a long way also from the original Brabazon IV which started out as a high-speed jet-propelled Atlantic mailplane. It was later modified into a 60,000 lb 14-passenger landplane with three D.H.-H.2 jet engines, and then to a 24 36-passenger aeroplane for fast Empire services." Mr. Masefield continues: "One of the tragedies of the Brabazon Committee's plans was that the Brabazon III never materialized. It was to be: 'A 90,000 lb landplane for Empire trunk services, powered by four gas turbine propeller engines.' It was to have accommodation for 22 passengers and 6,000 lb of mail for Empire routes and 40 passengers and 6,000 lb of mail for European routes. Avro was selected to build this important aircraft and an interesting design round four Rolls-Royce Clyde engines was got out."

Mr. Masefield went on to say: "In the 1930s the bulk of the world's transport aircraft had a capacity for between 14 and 21 passengers; in the 1940s the size had risen to a capacity for between 27 and 44 passengers. Now, in the early 1950s the demands are for aircraft of between 47 and 56-passenger capacity. In the 1960s the demand inevitably will be for aircraft offering between about 70 and 120 seats—perhaps more."

There may yet be time to develop the Brabazons in time to meet 1965 requirements.

LOWER LANDING FEES

IT is announced that from May 1st the Ministry of Civil Aviation will cut landing fees by 50 per cent for aircraft arriving on international flights not exceeding 115 miles in length. Such a reduction should be of assistance to the operators of short-haul services and charter flights between Southern England and the French north-coast resorts. The Le Touquet to Lympne, Cherbourg to Southampton and Ostend to Southend routes all come within the 115-mile limit.

INDEPENDENT FLEETS

AS mentioned in *Flight* of February 8th, 30 Dakotas have been made available to civil buyers by the Air Ministry. Although it was at first believed that these aircraft were in good condition this does not now appear to be the case, and many will probably be used only for spares.

The few serviceable machines are not likely to increase the charter fleets, however, for although these released Dakotas may not be sold abroad there is no such restriction on aircraft of this type already in service. High prices paid by the U.S. for Dakotas may induce independent operators to sell their existing aircraft and replace them from the newly released machines.

HELICOPTERS FLY SOUTH

THE main base of British European Airways' helicopter unit is to be moved at the end of April from Peterborough to Gatwick. B.E.A. will have the use of a group of offices and half of a hangar in which the three Sikorsky S-51, two Bell 47 and one Bristol 171 helicopters will be housed.

This move will facilitate experimental flying in the London Control Area and the London-Birmingham scheduled operations will also be serviced from Gatwick.

NEW-ERA FLYING CONTROL

THE I.C.A.O. European-Mediterranean Regional Air Navigation Conference, now in session in Paris, is considering problems set by the operational altitude and speed of jet airliners. The limited endurance of these aircraft may necessitate a complete revision of the present system of airway and airport control. As is now generally agreed, stacking or orbiting would cost so much in fuel that without a new concept of control jet-transport operation could only be undertaken at a loss. With the introduction in the near future of B.O.A.C.'s Comets and, next year, B.E.A.'s turboprop-powered *Discovery* class, the solution of this problem becomes one of vital importance.

I.A.T.A. TO DISCUSS LANDINGS

AT the semi-annual meeting of the I.A.T.A. Technical Committee, held in Madrid during January, two important subjects of concern to international airlines were chosen for ultimate discussion at the I.A.T.A. Technical Conference to be held in Copenhagen from May 5th to 16th.

Consideration will be given to all factors affecting approach and landing of aircraft and there will be an exchange of views on future airborne radio equipment.

Over 200 technical representatives of airlines, governments, manufacturers and research laboratories are expected to attend. It is hoped to develop and co-ordinate an overall picture of these two subjects in order to assist development now going on in their various individual phases.

The Technical Conference will also have a full agenda of communication, engineering, meteorological and operation matters. The chairman will be Capt. J. C. Kelly-Rogers of Aer Lingus.

B.O.A.C. WANTS STEWARDESSES

STEWARDESSES getting engaged or married at the rate of one a week have made it necessary for B.O.A.C. to seek replacements. More than 800 girls anxious to fill the gap have applied to the Corporation for employment, but less than three per cent of those interviewed have been finally accepted.

The Corporation still has a number of vacancies for British girls between the ages of 21 and 35, "of smart appearance and with a pleasing and well-developed personality." Stewardesses receive £5 17s 6d a week plus £2 a week flying pay when they begin full flying duties. Maximum salary is £7 7s 6d plus flying pay and out-of-pocket allowance when out of the United Kingdom.

T.W.A.'S TOURIST PLANS

WITH virtually all T.W.A.'s new tourist services already fully booked for July, the company's sales vice-president, Mr. E. O. Cocke, announced that the airline will begin the new low-cost flights with daily schedules on May 1st; the inaugural flight is already completely booked. Revealing more details of the tourist-class flights, Mr. Cocke said that London will be served with four flights a week in each direction, and there will be three services weekly to Paris in each direction. Further, T.W.A.'s several daily domestic tourist flights from nine major cities across the U.S. will connect at New York with international tourist flights, via one airline, from such cities as San Francisco, Chicago, St. Louis and Pittsburgh to their European counterparts.

WHITE TOPS OR CABIN COOLERS?

DURING the past few years white-painted roofs for airliners operating in warm climates have become such accepted practice that a recently expressed contrary view is worth mentioning.

The rebels are Trans-Canada Air Lines, who remark in a recent news-sheet: "We now know certain facts: (1) During conditions of hot sun and low wind an aircraft with a white top does not heat up to as high a temperature as one with an ordinary aluminium top. The actual average difference appears to be about 10 deg. F. White tops do not cool the aircraft. They only prevent it from becoming quite as hot as it would under ordinary conditions. (2) We also know that the major airlines in the United States, with the exception of American Airlines, are now either using or propose to use white tops on their aircraft. (3) Certain people prefer the appearance of aircraft with white tops to those without. (4) The cleaning of a white-painted surface is also less time-consuming than the polishing of an aluminium metal surface.

"On the other side of the ledger we also discovered certain features:—(1) The 10 deg. F. temperature-reduction mentioned above is very considerably reduced in cases of appreciable breeze where the doors of the aircraft are left open. (2) The effect of the white tops disappears once the aircraft starts to move at a reasonable rate of speed. (3) The cost of painting the tops of our aircraft white down to the window line would be about 200 dollars per aircraft, because we would have to repaint the 'Trans-Canada Air Lines' along each side of the aircraft. (4) The empty weight of the aircraft would be increased by about 50 lb. (5) The cooling effect we get from our cabin fans is considered a more effective method of providing passenger relief from heat than the small temperature drop which we feel white tops will provide. American Airlines, the other major operator without white tops, has cabin fans installed similar to our own. (6) We also have, at Toronto and Montreal, aircraft ground-coolers which are more effective than those of any other operator.

"With all the above facts facing us, it was necessary to come to some decision regarding white tops on TCA aircraft. It must be appreciated that hot weather conditions bother us only for about 10 per cent of the days of the year and about half the flights on those days. To improve conditions to a varying degree for those flights we would have to spend 10,000 dollars and carry 50 lb of excess weight round for the other 95 per cent of the flights. The payload on the North Atlantic and on such domestic flights as Moncton-Montreal and Lakehead-Winnipeg is a critical item.

"It is apparent that personnel of our Company's stations are now well trained in the prudent use of aircraft fans in keeping aircraft conditions at a reasonably acceptable degree.

"We have, therefore, decided against painting the tops of TCA aircraft white, and feel that, since we have two units of the most efficient aircraft-cooler available, the 10,000 dollars it would cost us to go ahead with the project can be spent better at some future date if put towards the purchase of additional cooling units."

BREVITIES

FOR the first time in its 29-year history, Sabena has carried more than a quarter of a million passengers in one year—to be exact, 260,674 passengers in 1951, a 33.3 per cent increase over its 1950 figure. Freight traffic in 1951 rose by 76 per cent.

* * *

An Air France Languedoc on the Tunis-Paris service crashed on taking off from Nice last Monday; all on board lost their lives. Early reports stated that two engines were put out of action when the aircraft hit a flock of birds.

* * *

A B.E.A. Elizabethan aircraft was due to make a proving and demonstration flight this week from London to Geneva, Milan and Nice. Further flights will shortly be made to Zürich and Vienna and Copenhagen and Stockholm.

* * *

President Truman has instructed a Presidential Commission to inquire into airport and airport control conditions at Newark, New Jersey. The Commission, headed by General James H. Doolittle, began its investigation on February 26th.

* * *

The Minister of Transport and Civil Aviation, Mr. J. S. Maclay, in answer to a question, said in the House of Commons on February 27th that he was discussing with those concerned the possibility of reserving a site at the South Bank as a London helicopter "airstop."

* * *

The operations of Scandinavian Airlines System for the fiscal year, October 1st, 1950-September 30th, 1951, showed a net profit of £175,104. Gross income was £12,672,965 and total expenditure £11,302,827. £1,195,034 was deducted for depreciation. During the year 500,000 passengers, 17,000,000 lb of freight and 5,000,000 lb of mail were carried.

MOLE'S METHOD DISCARDED: A good idea of the vast engineering problems associated with the construction of a large international airport is given by this recent photograph, showing the building of the four-lane tunnel which will link the central terminal area at London Airport with the Bath Road. It is being made on the "cut and cover" principle and will pass beneath No. 1 runway, which will be re-opened on completion of the tunnel.

FOR HOME CONSTRUCTION: This sturdy little machine, powered by a Continental A.65 engine, is yet another example of the many light aircraft which are appearing on the French market today. Built by the firm of Avions Roger Adam, and designated the Roger Adam 14, it is designed for easy construction by amateurs, the complete set of plans costing the equivalent of about £5.

GEMINI FROM THE EAST: Seen at Gatwick recently was this Gemini of the Royal Singapore Flying Club; it had been flown from Singapore by Mr. A. F. W. Andren (centre), chief technical officer to the Malayan Department of Civil Aviation. Accompanying him was Mr. John Vine, captain of the R.S.F.C. (left); there to meet them was Mr. W. D. Beckingham, ex-airport-manager at Singapore.

FROM THE CLUBS

ON Sunday, May 25th, the Ragosine-Auster Homing Trophy competition will be held at Rearsby, Leicester. Designed to form a straightforward test of flying and navigation, this well-established "annual" gives all contestants an equal chance, for they are handicapped on personal flying hours. Entries are restricted to Austers, using Ragosine oil for the event; and the same aircraft may be flown during the day by different pilots. Further details will shortly be available from the Ragosine Trophy secretary at Rearsby Aerodrome. Last year's event was won by T. B. Meek (Autocrat, Auster Flying Club), with T. F. Ringer as runner-up; for three consecutive years the trophy (with which goes a replica for retention by the holder) had been won by members of Brough Flying Club.

The impressive Ragosine Trophy.

The Auster Flying Club, by the way, are already hoping that their 1952 rally and display (Rearsby, June 14th) will be the best and biggest yet.

HAVING successfully surmounted the difficulties which inevitably stand in the way of all flying clubs during the winter months, the West London Aero Club, which operates from White Waltham, is now preparing for a busy season.

During January the club's fleet of Tiger Moths, Hornet Moths and one Tipsy flew a total of 105 hr and three members gained their Private Pilots' Licences. West London has also been allotted a party of A.T.C. cadets for flying training, one of whom, Harry Skinner, recently obtained his P.P.L.; of the three at present under training, two have already soloed.

Club membership now amounts to 250, all of whom are active flying members; and of this total some 30 are private owners. Under the instruction of the C.F.I., Miss Joan Hughes, members can fly for £2 7s 6d in Tiger Moths and £2 17s 6d in Hornet Moths, whilst solo rates are £2 17s 6d and £2 7s 6d respectively. Apart from its own members, the W.L.A.C. offers instruction to the Fairey Flying Club, which also operates from White Waltham with a fleet of Tigers, Austers, a Maggie and a Tipsy.

Walking around the hangars at White Waltham recently we noticed that an unusually wide variety of aircraft was housed therein—the Gipsy Major-powered Avro Cadet G-ACHP, the faithful old Puss Moth G-AAZP, Hugh Scrope's damaged Mew Gull G-AEXF, various Fairchild Argus (Arguses, Argi?), a Whitney Straight and a Vega Gull, to mention but few. The first-named machine has now been acquired by the Vintage Aeroplane Club for use by its members and will begin operations as soon as its C. of A. is completed. G-AAZP, at present owned by Mrs. Edna Bianchi, has been used extensively by B.A.C. members during the past few months; G-AEXF still awaits a fairy godmother with a large bank balance to get it airborne again.

I.C.A.O. CONSIDERS PRIVATE PILOTS' LICENCES

WE publish here a summary of certain of the more interesting decisions taken by the Fourth Session of the Personnel Licensing Division of I.C.A.O., which met in Montreal during February. Most of these decisions will eventually be incorporated as amendments to the existing I.C.A.O. international standards and recommended practices on personnel licensing, but before they reach this stage they must be submitted to the I.C.A.O. member-states for comment, reviewed in detail by the Air Navigation Commission, and approved by the I.C.A.O. Council.

According to the terms of the I.C.A.O. Personnel Licensing Standard (Annex 1 to the Convention on International Civil Aviation) a private pilot is not permitted to fly for remuneration, even if the aircraft he is flying is not being operated for remuneration. The Division recommended that the remuneration restriction should be altered to apply only to the purpose for which the aircraft is being flown, and not to the pilot himself. This amendment is not designed to permit the private pilot to carry fare-paying passengers or cargo for hire, nor to allow him to enter commercial operations, but it would clearly permit the following, certain of which are not now allowable for the private pilot in some countries :—

(*a*) An owner pilot may use his machine for personal purposes in connection with his business.
(*b*) A salesman may pilot his own aircraft.
(*c*) An executive may pilot himself to and on his firm's business.
(*d*) A private pilot may perform pleasure or tourist flights with friends or acquaintances as passengers with whom he shares the actual cost of operating the aircraft.
(*e*) A man with a private pilot's licence may work as a test pilot.

The Division was of the opinion that the existing flying-time requirements for the issuance of senior commercial pilots' and airline transport pilots' licences (involving 200 and 250 hours of pilot-in-command flying time respectively) were, for the majority of applicants, too difficult to obtain in larger aircraft and that in many cases pilots were forced to obtain pilot-in-command time at their own expense in very small aircraft. The Division, therefore, agreed that co-pilot time, during which the co-pilot carried out the duties of a pilot-in-command under the supervision of the first pilot, should be accepted in part as fulfilling the requirements of the two licences.

The Division also agreed to a proposal for separation of instrument rating requirements from the requirements for the senior commercial pilots' licence itself. This was designed to make the senior commercial pilots' licence more useful under certain operations which are normally conducted under visual flight rule conditions. Because of this amendment the privileges of the licence were restricted to V.F.R. only, unless the senior commercial pilot also holds an instrument rating.

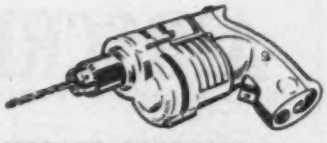
The Division also made provision to ensure more flexibility in the required medical standards, taking into account the fact that experience will frequently compensate for certain medical deficiencies. The flexibility clause will ensure that the overall safety standard is not lowered, but that experienced pilots who are borderline cases, as far as medical requirements are concerned, may be allowed to continue to fly.

Various other changes and alterations concerning aircraft maintenance engineers', commercial pilots' and senior commercial pilots' licences were also made, all of which will eventually be incorporated in the Annex 1 to the Convention on International Civil Aviation.

A comparison of 'output'

Many months of investigation, with visits (all paid all weighed) to and from the United States of Ameriky have produced startling conclusions on comparative output per worker in the two countries. It turns out that the British Worker, *per se, ipso facto,* and *nulli secundus,* is in no way inferior to his American counterpart. He marries less frequently, sees the sea more often ("But it must be remembered" says the Report* "that the United Kingdom is an island") drinks less Coca Cola and uses different cuss words. But he has the same number and kind of hands and his brain ticks in similar fashion to the American Thinking Box. "We have reached the conclusion," says the Report* perhaps a little obviously "that all that is necessary to raise British productivity is the provision of more and more and more and more Desoutter Power Tools."

* *This report was specially written by a Committee of Desoutter's Little Horses with the Managing Director as its amiable Chairman. The report was unanimous.*



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SERVICE AVIATION

Royal Air Force and Naval Aviation News

HIGHTIME IN EGYPT: Chocks, "trolley-accs" and wire-mesh intake guards are removed as Vampires scramble at Deversoir during Exercise "Hightime," held in the Canal Zone last week-end. Twelve squadrons from five air bases took part in this three-day exercise.

Naval Aviation in the Estimates

IN his presentation of the Naval Estimates, Mr. J. P. L. Thomas, the First Lord of the Admiralty, briefly reviewed the part played by Naval Aviation in the Korean war and recalled that H.M.S. *Eagle*—the most modern of the Navy's fleet carriers—had been commissioned during the past year. "The re-equipment of our air groups with jet squadrons," he said, "has proceeded, and the front line strength appreciably increased. The modernization of our naval air stations has continued, including the extension of runways and the improvement of radio aids in order to provide for the operation of new types of aircraft.

"Two aircraft carriers are now equipped with helicopters for rescue and search duties, a number of special radar equipped aircraft have been received as military aid from the United States, and a steam catapult has been developed which, when fitted, will enable carriers to operate the future heavier and faster types of aircraft. A fifth R.N.V.R. air squadron has been formed."

Under the heading of Research and Development he said: "For offensive use in fleet actions and for the protection of conv s from air attack, new and faster naval aircraft are being produced which, with their parent aircraft carriers, will be fitted with radar equipment, enabling accurate interception to be made at effective ranges from the surface vessels. To deal with those enemy aircraft which succeed in penetrating these defences, new gunnery systems of greater range, accuracy and destructive power are being worked out and gun and gun-direction equipment, which will provide the merchant ship herself with an effective defence, are being progressed. It should be noted that the Admiralty is also responsible for meeting the requirements for fire control equipment for the Army and new systems are at present under development for light and medium anti-aircraft guns.

"The most promising weapon in the anti-aircraft armoury will undoubtedly be the guided weapon, capable of engaging the enemy at ranges between that at which our fighter aircraft and our anti-aircraft guns are most efficient. Work on guided weapons is closely integrated with the whole programme of guided weapon development."

"Saclant" in Britain

THE Supreme Allied Commander, Atlantic, Admiral McCormick, U.S.N., held a Press conference at the Admiralty during his visit to this country last week. He was very reticent concerning operational matters but did define the area under his command as, roughly, the Atlantic ocean north of the tropic of Cancer and up to the 100-fathom line from the NATO countries' coasts. (This second delineation really denotes the limit of mineable water.) Headquarters would be at Norfolk, Virginia, and there would be no set-up on this side of the Atlantic.

Discussing the maritime-air side of his command, he pointed out that Coastal Command would serve all three naval commands, Atlantic, Home and Channel. The Admiral also expressed the opinion that, for some years to come, warfare in the Atlantic must be similar to that of the last war. He would, he said, rely to a great extent on shore-based aircraft but would need, in addition, all the carriers he could get. Admiral McCormick also made it quite clear that the intention was not to have actual forces under his command, but to make plans and to earmark forces to implement those plans.

Deputy to Admiral McCormick is Vice-Admiral Sir William Andrewes, R.N., who has twice before operated with the U.S. Navy—in the Pacific during the war and at the outbreak of hostilities in Korea.

Retirement

THE retirement, owing to ill-health, of Air Marshal Sir Charles R. Steele, K.C.B., D.F.C., is announced. In the first World War he served in the Yorkshire Regt. and the Royal Flying Corps, and in the second was A.O.C. No. 85 Group, 2nd T.A.F. Since the end of the war he has been S.A.S.O. at H.Q., B.A.F.O., and A.O.C., Malta.

Inter-Services Rugby

A HARD fought but only mildly interesting game at Twickenham last Saturday resulted in an 11-3 win for the Army from the Royal Navy. Two excellent kicks—one a dropped penalty kick by Hardy from the half-way line—gave the Army their opening lead. The wing three-quarters were starved for most of the game; Gray of the Navy did not get a single good pass from his Rugby League centre, and Phipps, the Army's international wing, was not used until the closing stages of the game. Defence outside and kicking were both very good. Though the less dangerous side, the Navy managed to keep much of the game in their opponents' half.

The R.A.F., who lost to the Navy by 6 points to nil on February 16th, meet the Army on March 22nd. If the R.A.F. win, there will be a triple tie for this season. If the Army defeat them, they take the title from last year's champions, the Royal Navy.

New P.C. Opportunities

THE Air Council has decided to create opportunities for G.D. officers holding short-service commissions to obtain permanent commissions in some ground branches. These include the Technical, Equipment, Secretarial, Fighter Control, Provost and Catering Branches. It is felt that this

ANGELS ONE FIVE: Among the guests at a special screening of the Associated British-Templar Battle of Britain film of the foregoing title were: (Upper group) Mr. D. E. Griffiths, vice-chairman of the executive committee of the R.A.F. Cinema Corporation; Lord Willoughby de Broke; Michael Denison and Dulcie Gray, who star in the film; and Air Chief Marshal Sir Arthur P. M. Sanders. In the lower group will be recognized Marshal of the R.A.F. Lord Tedder, Air Chief Marshal Sir James Robb, Air Marshal Sir John Whitworth Jones, A. V-M. W. J. Seward and A. V-M. R. S. Blucke.

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scheme will eventually ensure a cadre in each of these branches, of officers with flying experience.

The prospects of officers already in these branches being appointed to permanent commissions will not be affected. The entry of short-service officers from civilian life will be reduced to compensate for the new inflow from the General Duties Branch.

Ultimately it will be the aim to fill the higher ground-posts in these branches with fully qualified officers drawn from civil life and trained under R.A.F. arrangements, by regular airmen and airwomen selected for permanent commissions, by W.R.A.F. officers selected for permanent commissions and, as a result of this new measure, by short-service officers of the General Duties Branch selected for permanent commissions.

Director of Educational Services

THE Air Ministry announces the retirement, due to take place on August 1st next, of A. V-M A. H. Robson, C.B., O.B.E., M.C., M.Sc., Ph.D., Director of R.A.F. Educational Services. He will be succeeded by G/C. C. L. M. Brown, O.B.E., M.A., A.D.C.

Spiritual Mission

AFTER eight months of planning by the Chaplains Branch, a large-scale mission to the R.A.F. started on March 1st and will go on until November 9th. The head of the mission is the Chaplain-in-Chief, the Rev. Canon L. Wright. Over 300 members of the clergy, including 25 bishops of the Church of England, are giving their services.

New Director of Organization

IN May next A. Cdre. J. N. T. Stephenson, who has been Commandant of the R.A.F. Staff College since November, 1949, is to become Director of Organization (Forecasting and Planning) at the Air Ministry. This will be his second tour of duty in the Directorate—he was there at the outbreak of war in 1939 until taking over command of No. 613 Squadron.

A.T.C. Boxing Championships

THE Air Training Corps boxing championships are to be held at the Royal Albert Hall on Monday, March 31st. Semi-finals will be staged in the provinces—the northern at Glasgow on March 8th and the southern at the Bristol Aeroplane Company's works on March 15th. Tickets for the Albert Hall will range from 2s. 6d. to one guinea but the gallery will be free to A.T.C. members in uniform.

Air Marshal Edwards

WE regret to record the death of Air Marshal H. Edwards, R.C.A.F., which occurred last week at Scotsdale, Arizona. He was 59. Air Marshal Edwards will be remembered as the war-time chief of the Royal Canadian Air Force overseas and for the part he played in launching the British Commonwealth Air Training Plan.

In the first World War he was shot down and taken prisoner by the Germans. Twice he escaped but was recaptured on both occasions. After release in 1918 he joined a group of airmen who took aircraft and equipment to serve with the White Russians under Gen. Deniken.

Another R.C.A.F. Squadron Arrives

THE second R.C.A.F. Sabre squadron to arrive in England landed last week and joined the Canadian Fighter Wing at North Luffenham, Rutland. The new unit, No. 441 (Silver Fox) Squadron, commanded by S/L. A. MacKenzie, D.F.C., crossed the Atlantic in the *Empress of France* but its Canadair-built Sabres have been awaiting the pilots' arrival. They were brought over last November on the carrier H.M.C.S. *Magnificent* with the aircraft for their sister squadron, No. 410. Later in the spring No. 439 Squadron will arrive, to complete the Fighter Wing.

While in Britain all three units will come under the operational control of Fighter Command but, at a later date, after having moved to the Continent, they will be grouped with the U.S.A.F.

Silver Fox Squadron was re-formed a year ago and equipped with Vampires before converting to Sabres. As a wartime unit it operated both from Britain and the Continent.

No. 439, commanded by S/L. C. Bricker, D.F.C., has only been re-formed during the past six months. It was originally formed in Britain in 1944 and flew Hawker Typhoons.

DROPPING IN: Major-Gen. R. E. Urquhart, of Arnhem fame, arrived by Westland-Sikorsky to visit paratroops of the Special Air Service operating in the Malayan jungle against a Communist-held village.

IN CANADA, IN BRITAIN: (Above) Air Chief Marshal the Hon. Sir Ralph Cochrane, V. C.A.S., being greeted on arrival at Uplands, Ottawa, by A.V-M. F. R. Miller, V. C.A.S., R.C.A.F. Sir Ralph is visiting various R.C.A.F. establishments. (Left) S/L. A. MacKenzie, R.C.A.F., who arrived in Britain last week to command No. 441 Squadron, R.C.A.F., at North Luffenham.

Ties

A DONATION raised by private subscription in Jamaica has provided a fund to provide a squadron tie for No. 139 (Jamaica) Squadron. The tie has a navy background with the central portion of the unit's badage superimposed at intervals. It is available only from the squadron adjutant.

S/L. W. E. Thomas at Fighter Command H.Q., Bentley Priory, Stanmore, Middlesex, has produced a tie for members of No. 264 Squadron. A quantity of these has been ordered and may be had direct from S/L. Thomas.

A tie, maroon with blue stripes and dam motifs in gold, has been designed for No. 617 Squadron. Costing 15s., it is available to anyone who has been on the posted strength of the unit, but is obtainable only from the squadron adjutant.

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Malta Reunion

THE guest of honour at the R.A.F. Malta reunion will be Air Chief Marshal Sir Hugh P. Lloyd, A.O.C.-in-C. Bomber Command. He was A.O.C. Malta from May 1941 to July 1942. The dinner will be held in London on Saturday, April 26th, the nearest date available to the tenth anniversary of the award of the George Cross to the island. Tickets, price 21s, may be obtained from Mr. J. Adams, 16, Devonshire Row, London, E.C.2.

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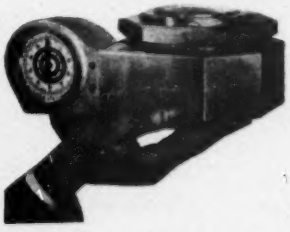

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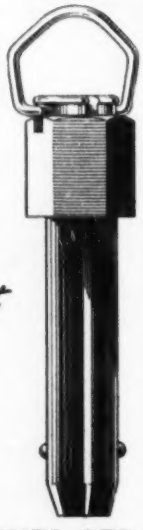

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THE Board of Entry of the College invites applications from suitable candidates for the two-year course commencing in the autumn of this year. Candidates should be of graduate standard, although the possession of a degree is not essential; a good Higher National Certificate is an acceptable qualification. The College, a post-graduate institution, is devoted to the study of aeronautical science and engineering. The curriculum covers the five main subjects of aerodynamics, aircraft design, aircraft electrical engineering, aircraft propulsion, and aircraft economics and production. Instruction in the first year is designed to provide students with a broad background of knowledge in all subjects, with opportunity for limited specialization in two or three subjects. In the second year students specialize more particularly, usually in one subject. Experiments in the air are an important part of the work, both in the first year when all students take part in them and in the second year when they are linked to the specialist work of the departments. Students who satisfactorily complete the course will receive the diploma of the College.—Further particulars and details of the procedure for enrolment may be obtained on application to: The Registrar, The College of Aeronautics, Cranfield, Bletchley, Bucks. [7762

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LEARN to fly. 25 minutes London. 65/- per hour.—Phone VICtoria 1300. Join the Penguin Squadron. [7778

LEARN to fly for £24; instructors' licences and instrument flying for £3 an hour; night flying £3/10/- an hour, residence 4½ gns. weekly. Approved M.C.A. private pilot's licence course.—Wiltshire School of Flying Ltd., Thruxton Aerodrome, Andover, Hants. [0338

A.F.R.Ae.S., A.R.B.Certs., A.M.I.Mech.E., etc., on "no pass, no fee" terms; over 95% successes. For details of exams. and courses in all branches of aeronautical work, navigation, mechanical eng., etc., write for 144-page handbook free.—B.I.E.T. (Dept. 702), 17, Stratford Place, London, W.1. [0707

FREE! Brochure giving details of courses in all branches of aero eng. covering A.F.R.Ae.S., M.C.A., exams., etc. We are the only postal training college operated by an industrial organisation.—Write to E.M.I. Institutes, Postal Division, Dept. F20, 43, Grove Park Road, London, W.4. Tel.: Chiswick 4417. (Associated with H.M.V.) [0026

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SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service etc. if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

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Applications, stating age, experience and salary required to
CHIEF DRAUGHTSMAN
THE DE HAVILLAND AIRCRAFT CO., LTD.,
HATFIELD, HERTS [0031

CROWN AGENTS FOR THE COLONIES
METEOROLOGICAL assistants required by the Government of Northern Rhodesia for a tour of about three years with prospect of pensionable employment. Commencing salary according to qualifications and experience in scale £588, rising to £774 a year (including cost-of-living allowance). Free passages. Liberal leave on full salary. Male candidates must have matriculated, attended a recognised meteorological course and had considerable practical experience. Intimate knowledge of the correlation and compilation of climatological returns and statistics, including operation of calculating and tabulating machines, would be an advantage.
Apply at once by letter, stating age, full name in block letters, and full particulars of qualifications and experience and mentioning this paper to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting on letter M 27976/E. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. [7785

COUNTY BOROUGH OF SOUTHEND-ON-SEA
APPLICATIONS are invited for the appointment of FLYING INSTRUCTOR at the Southend Municipal Airport. The appointment, which is terminable upon one month's notice, is subject to the National Conditions of Service, to the Local Government Superannuation Act, 1937, and to medical examination. Applicants must possess a current commercial pilot's licence fully endorsed for flying instruction. The successful candidate will be responsible to the Airport Manager for the operation of the Flying School at the Airport.
Applications, containing particulars of qualifications, experience, salary required, etc., together with copies of three recent testimonials, to be submitted to the undersigned not later than Monday, March 17th, 1952.
ARCHIBALD GLEN,
Town Clerk.
Municipal Buildings,
Southend-on-Sea.
March 6th, 1952. [7790

NAVAL AVIATION
YOUNG men between 17 years and 24 years are required for short service commissions in the ROYAL NAVY for eight years' flying duty as pilots or observers. It is intended that up to 30 per cent of those completing the engagement shall, if suitable, be given permanent commissions. The remainder will pass to the Reserve for seven years and be paid a tax-free gratuity of £1,500. Applicants must have School Certificate with a pass in mathematics or a General Certificate of Education with passes at ordinary level in English language, mathematics and one other subject, all taken at the one sitting, or equivalent educational qualifications, and be physically fit.
Write to Secretary of the Admiralty (C.W.530 F.), Queen Anne's Mansions, London, S.W.1. [7635

BLACKBURN AND GENERAL AIRCRAFT, LTD., have vacancies for the following personnel on an expanding programme of work of national importance:—
STRESSMEN, senior and intermediate, with sound qualifications and aircraft experience.
DRAUGHTSMEN, all grades, preferably with aircraft experience, but applications are invited from those with light mechanical or structural experience.
LOFTSMEN and LOFTSWOMEN, with experience of aircraft full-scale layout work.
Applications, giving particulars of age, training, experience, etc., to
The Personnel Superintendent,
BROUGH, YORKS. [7713

VICKERS-ARMSTRONGS, Ltd. (Aircraft Section) have vacancies at Hurn Depot for the following staff:—
AIRCRAFT STRESSMEN.
DESIGN DRAUGHTSMEN
(aircraft experience preferable but not essential).
JIG AND TOOL DRAUGHTSMEN
(aircraft experience preferable but not essential).
APPLY, in writing, to the Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge, Surrey. Applications are subject to the approval of the Ministry of Labour and National Service. [7783

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IN THEIR AIRCRAFT DRAWING OFFICE, BELFAST
(preferably with aircraft experience).
Applications, stating age, experience and salary required, to:
CHIEF DRAUGHTSMAN,
SHORT BROS. AND HARLAND, LTD.
QUEEN'S ISLAND, BELFAST [7613

HANDLEY PAGE, Ltd., have vacancies for:—
AERODYNAMICISTS of degree standard or with H.N.C. in aero subjects. Previous experience preferred.
WIND tunnel technicians of degree standard or with H.N.C. in aero subjects. Previous experience preferred.
STRESSMEN of degree standard or with H.N.C. in aero subjects. Previous experience preferred.
SENIOR design and intermediate draughtsmen, preferably with aircraft experience, for Cricklewood and Radlett offices. Consideration will be given to applicants with experience in light structural or mechanical engineering. Possession of O.N.C. or H.N.C. (Mech. or Elect.) an advantage.
LOFTSMEN with previous experience of full-scale layout work or similar workshop practice.
TECHNICAL authors, preferably with experience in the preparation of maintenance manuals, pilots' notes, technical specifications, etc.
TECHNICAL illustrators with previous experience in aircraft work.—Write, stating age, qualifications and details of experience, to: Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [7780
HANDLEY PAGE, Ltd., have vacancies for:—
(a) JUNIOR assistants, male or female, for work in their Test House at Cricklewood, on material and process control.
(b) JUNIOR and senior assistants of H.N.C. or degree standard for work in their Mechanical and Structural Test Dept. at Radlett.—Write, stating age and full particulars of qualifications and experience, to: Staff Officer, Handley Page, Ltd., Claremont Rd., London, N.W.2. [7758
WESTLAND AIRCRAFT, Ltd., Yeovil, Somerset, require:—
SENIOR and intermediate draughtsmen.
STRESSMEN.
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DESIGN and detail draughtsmen are required for interesting work on the following:—
HIGH pressure hydraulic and electro-hydraulic components. Hydraulic servos for aircraft and special projects. Strength and functional test rigs for undercarriages and hydraulic components.
PREVIOUS experience on type of work not essential.—Applicants should write, stating age, experience and salary required, to Mr. R. J. Brown, Chief Draughtsman, British Messier, Ltd., Cheltenham Road East, Gloucester. [7764
ENGINEER required with A, B and C licences and experience on light aircraft, for work in the Midlands.—Box No. 7339. [7797
STRESSMEN required for aircraft structural work.—Tiltman Langley Laboratories, Ltd., Redhill Aerodrome, Surrey. [7793
AIRCRAFT DESIGN TECHNICAL OFFICE requires the following personnel for work on an interesting range of civil and military aircraft and helicopters:—
JUNIOR and intermediate technicians for aircraft structural analysis. Engineering degree or Higher National Certificate, preferably with aircraft stressing experience.
JUNIOR and intermediate technicians for Engineering Development Laboratory. Higher National Certificate and preferably with experience of structural or general engineering test work.
JUNIOR and intermediate weights assistants, with National or Higher National Certificate in Engineering and some experience in an aircraft weights section of drawing office.
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APPLICANTS should state age and give full details of qualifications and experience to The Personnel Manager, The Bristol Aeroplane Co., Ltd., Aircraft Division, Filton House, Bristol. [7794
AIRCRAFT or mechanical draughtsmen required, all grades, for appointment at Langley Offices.—Apply, in first instance, stating age, experience and salary required, to:—
THE Chief Draughtsman, Alan Muntz and Co., Ltd., (Aircraft Section), Heston Airport, Hounslow, Middlesex. [0050
JAMES YOUNG, Ltd., Bromley, Kent, urgently require bench fitters for aircraft metal components.—Apply to your local Ministry of Labour and National Service. [7786
DESIGNER draughtsman with experience in light engineering, electrical knowledge an advantage. Salary according to qualifications.—Bryans Aeroquipment Ltd., Willow Lane, Mitcham Junction. [7742
JIG and tool draughtsmen required by Percival Aircraft, Ltd., Luton Airport, Beds, fully experienced.—Applications, in writing, to Manager, Ministry of Labour and National Service, Luton, Beds. [0060
LICENSED radio engineer and radio mechanics at our base at Stansted Airport, Essex.—Apply by letter or telephone, to the Senior Radio Engineer, Aviation Traders Ltd., Southend Airport, Essex. Tel.: Rochford 5401. [0050
REQUIRED immediately, Dakota captains. Salary in accordance with B.A.L.P.A. rates.—Apply, Chief Pilot, Air Transport (Charter) (C.I.), Ltd., Blackbushe Airport. [7781
WEIGHT estimator required by Percival Aircraft, Ltd., Luton Airport, Beds, for work on fixed wing and helicopter aircraft.—Apply, giving details of age, qualifications, experience and salary required to: Manager, Ministry of Labour and National Service, Luton, Beds. [0052

SITUATIONS VACANT

JUNIOR radio engineer with current M.C.A. Air Licence required for aircraft installation, testing and flying duties.—Write, stating experience, qualifications, age and salary required, to the Personnel Manager, The De Havilland Aircraft Co., Ltd., Christchurch, Hants. [7769]

GLOSTER AIRCRAFT Co., Ltd., have vacancies for fully experienced aircraft structural and electrical draughtsmen.—Applications, in writing, stating age, experience and salary required, must be made through an Employment Exchange or Scheduled Agency. [0810]

TECHNICAL authors and illustrators required by Percival Aircraft Ltd., Luton Airport, Beds. Knowledge of M.o.S. procedure desirable.—Applications, in writing, stating age, experience and salary required to Manager, Ministry of Labour and National Service, Luton, Beds. [0804]

GLOSTER AIRCRAFT Co., Ltd., require senior and junior weight engineers, interesting work on new projects. Permanent positions offered to suitable applicants. —Applications in writing, stating age, experience, qualifications and salary required, must be made through an Employment Exchange or Scheduled Agency. [0811]

EXPERIENCED drawing office checker required to check detail drawings and general arrangement drawings of aircraft hydraulic components and undercarriages, etc.—Write, stating age, experience and salary required, to Mr. R. J. Brown, Chief Draughtsman, British Messier, Ltd., Cheltenham Road East, Gloucester. [7758]

LANCASHIRE AIRCRAFT CORPORATION have vacancies for aircraft captains, pilots with commercial licence, instrument rating, navigators, radio officers. Salaries in accordance with qualifications and experience. —Application to Personnel Manager, Bovingdon Airport, near Hemel Hempstead, Hertfordshire. [7751]

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [0620]

TECHNICAL assistants required for development of small mechanical/electrical aircraft components. Degree, Higher National Certificate or equivalent essential.—Apply, in writing, to Chief Development Engineer, Wilkinson Sword Co., Ltd., Porte Mill Works, Colnbrook, Bucks. [7776]

AIRCRAFT inspector required with minimum of five years recent experience on multi-engine aircraft including repairs and maintenance. Preferably with A. and C. licences on York, Lancastrian and Merlin.—Apply, Personnel Manager, Flight Refuelling, Ltd., Tarrant Rushton Airfield, Nr. Blandford, Dorset. [7773]

AIR FORCE, Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd., Luton Airport, Beds. Applications are invited from senior and junior draughtsmen, and stressmen for work on this interesting programme.—Write, giving details of experience and salary required, to Manager, Ministry of Labour and National Service, Luton, Beds. [0806]

AIRCRAFT maintenance engineer wanted, preferably licensed A. and C., for duties in Edinburgh district on Dakota/F. and W. 1630 and Sea Fury/Centaurus. Experience of R.A.F. and A.I.D. procedures an advantage. Salary according to experience and qualifications.—Apply, stating full particulars of age, experience, etc., to Box 7805. [7774]

DESIGNER-DRAUGHTSMAN for aircraft installations and commercial projects. Applicant should have sound engineering background. Experience in the fabrication of light-alloy components for both prototype and production an advantage.—Write, giving details of age and experience, to Chief Draughtsman, Delanny Gallay, Ltd., Edgware Road, Cricklewood, N.W.2. [7807]

IMPORTANT Midlands aircraft engine manufacturer has vacancies for a number of designers and senior and junior draughtsmen. The work is connected with gas turbine engines. Although experience is most advantageous it is not necessarily essential, as training will be given.—Apply in some detail, please, to Armstrong Siddeley Motors, Ltd., Reference 101, Coventry. [0616]

THE GLOSTER AIRCRAFT Co. requires senior and intermediate stressmen to work on designs and projects of advanced interest. Excellent prospects of advancement for sound and energetic men.—Applications in writing, giving full particulars of technical qualifications, age, experience and salary required, must be made through an Employment Exchange or Scheduled Agency. [0011]

JIG and tool draughtsman (age 25-35) required by manufacturers of automobile and aircraft accessories in South Midlands. Practical experience in toolroom and production shops, and good technical qualifications essential. Salary according to ability. Single accommodation available. State salary, age and full particulars.—Box 7195. [7761]

APPLICATIONS are invited from senior and intermediate design draughtsmen, experience of aero engine design desirable, but not essential. Also checkers. —Please write, state age and giving details of previous experience in chronological order to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. Apply through an Employment Exchange. [0809]

EXPERIENCED stressmen required by Percival Aircraft Ltd., Luton Airport, Beds, for responsible position in stress office. Minimum requirements B.Sc. (or equivalent), several years' experience, ability to take charge of stressing of complete aircraft.—Applications, in writing, to Manager, Ministry of Labour and National Service, Luton, Beds, giving details of training, experience, age and salary required. [0808]

SALES administration vacancy in small precision engineering business in the aircraft industry manufacturing own products of high quality. A serious educated man with a practical leaning now working in an industrial managerial capacity but wanting the benefit of country life preferred. Permanent position and good living conditions. Write, giving comprehensive details, experience, education, career, age and present salary.—Box 7366. [7772]

DESIGNER draughtsmen required by Lockheed Hydraulic Brake Co., Ltd., Leamington Spa. Should be fully experienced in light mechanical engineering. Knowledge of hydraulics an advantage. Opportunity for early promotion to section leader grade on proof of ability. Single hostel accommodation available.—Write to Personnel Officer, giving full particulars of salary, age and experience. [7782]

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HANDLEY PAGE, Ltd., have a vacancy for a technical assistant with a good mechanical engineering background, who will be required to carry out work in connection with thermo-dynamic problems for aircraft air conditioning and thermal de-icing systems.—Write, stating age and giving particulars of qualifications and experience, to: Staff Officer, Handley Page, Ltd., Claremont Rd., London, N.W.2. [7759]

TECHNICAL assistants, both junior and senior, required in mechanical engineering department for work of national importance in connection with development of gas turbine engines. Excellent prospects exist in sections dealing with rig test of engine components, vibration, static structure test and research in gears and bearings. Qualifications: degree or H.N.C.—Apply: Reference No. VI, Armstrong Siddeley Motors, Ltd., Coventry. [0862]

DRAUGHTSMAN, Blackburn (Dumbarton), Ltd., Castle Road, Dumbarton, require immediately a fully qualified draughtsman for their aircraft drawing office. Experience in the design and modification of aircraft is essential and considerable liaison duties are involved. Excellent working conditions, canteen facilities and a staff pension scheme in in operation. Applications, stating full details of qualifications, experience and age to be addressed to labour manager. [7788]

CHIEF flying instructor required by Derby Aero Club to commence duties end of March. Qualifications necessary: good instructional background, full G.A.P.A.N. endorsement; preference given to commercial licence holder. Good salary for suitable applicant, together with possibility of unfurnished accommodation.—Apply in writing in first instance, giving full details of experience and career, to Derby Aero Club, Ltd., Municipal Airport, Burnaston, near Derby. [7794]

APPLICATIONS are invited from design draughtsmen and stressmen, also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines.—Applications should state full particulars of experience and qualifications and should be addressed to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. Apply through an Employment Exchange. [0932]

TEST assistants, both junior and senior, are required for an interesting programme of structural testing. Juniors should hold Ordinary National Certificate and have preferably had some experience in this type of work. Seniors should have Higher National Certificate or its equivalent and a minimum of 2 years' experience in test work.—Apply, giving details of training and experience, to the Personnel Manager, Boulton Paul Aircraft, Ltd., Wolverhampton. [7804]

THE GLOSTER AIRCRAFT Co. requires the services of a number of aerodynamicists (a) for design and project work, and (b) for flight test reduction. Opportunity exists for individuals to vary their experience within the Aerodynamics Department. Candidates with some years' experience preferred, but applications from juniors with sound mathematical ability will receive full consideration. —Applications in writing, giving full particulars of age, experience and salary required, must be made through an Employment Exchange or Scheduled Agency. [0813]

HANDLEY PAGE (Reading), Ltd., have the following vacancies in their design office:—A senior stressman is required; must have good experience and a degree or Higher National Certificate with endorsements in aeronautical subjects. Also required are senior and intermediate draughtsmen with aircraft experience. The positions are progressive and offer excellent opportunities for the right men.—Please send full particulars to the Personnel Officer, Handley Page (Reading), Ltd., The Aerodrome, Woodley, Reading, Berks. [0874]

SITUATIONS WANTED

CHANGE of employment required. Designer, project engineer, or similar post. Twenty-five years of varied experience of aircraft manufacture and design.—Box 7362. [7771]

BOOKS

PRODUCTION Engineering: Practical Methods of Production Planning and Control, by P. E. Murphy, A.I.L.A. Intended for students of production engineering and young planning engineers, the book deals with the various items or functions in factory organisation. Treatment is general rather than particular, and is concerned with basic principles that can be adapted to local conditions. Fully illustrated by 99 diagrams and photographs. 256 pages. Price 12s 6d net, by post 13/-, from all bookshops, or the Publishing Dept., Dorset House, Stamford St., London, S.E.1.

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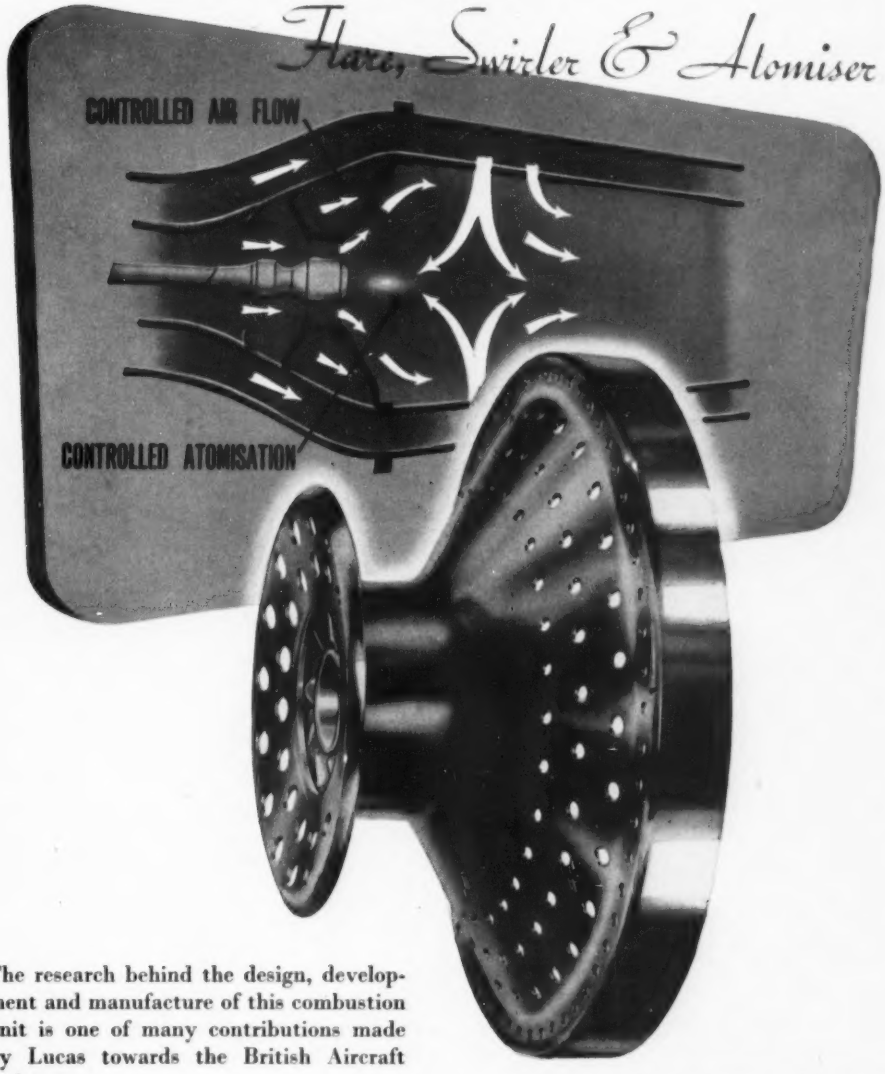

The research behind the design, development and manufacture of this combustion unit is one of many contributions made by Lucas towards the British Aircraft Industry.

Combustion and Fuel Systems for Gas Turbine Engines

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JOSEPH LUCAS (GAS TURBINE EQUIPMENT) LTD., BIRMINGHAM AND BURNLEY

1800 CATTLE AIRLIFTED...

IRELAND
. . . across the English Channel — during November and December —by "Bristol" Freighters of Silver City Airways . . .
LYMPNE
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ITALY

. . . Bound from Ireland to Italy, the cows crossed to France at the rate of 300 per week, Freighters taking off from Lympne every 90 minutes during daylight with loads of eight to eleven cattle. By flying this 47-mile stage of the journey, more than a day in delivery time was saved, and the animals arrived in far better condition than if they had gone by sea. Although "Bristol" Freighters have pioneered air transport of livestock in all parts of the world, this Silver City operation—fitted in between normal cross-Channel car ferry services —provides an outstanding example of Freighter versatility in everyday service. It also gives proof of the high rate of utilisation made possible by the reliability of "Bristol" Hercules engines which power the aircraft.

Bristol **Freighters — the world's most versatile cargo aircraft**

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